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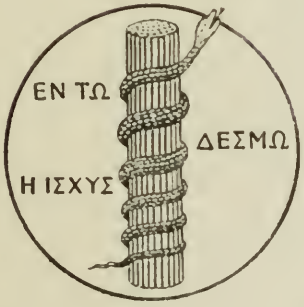

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EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

Influenza

THE serious character of the influenza epidemics of the past year is sufficiently emphasised by Dr. Dunlop's estimate, as in the discussion on influenza at the June meeting of the Edinburgh Medico-Chirurgical Society, that in Scotland the disease has caused 20,000 deaths, and these mostly in the age periods 15 to 45. Probably most of those who remember the epidemics of the early nineties will agree with Dr. Russell that the malady then was essentially the same as that which has recently played such havoc. Unfortunately, it cannot be said that, in the quarter century which has elapsed, our knowledge of influenza has undergone any very material advance. We are still quite in the dark as to the cause of its sudden pandemic spread, and as to why it has once again taken on so serious a character. It is tempting to blame for these the conditions which have obtained throughout Europe since 1914, and to suppose, with Dr. James, that the nations have trenched unduly on their reserves of strength in the effort to victory, but in face of the virulence of the epidemic in Africa and India, where such a factor could scarcely be operative, it seems almost impossible to escape the conclusion that exalted virulence of the infective agent has played a larger part. So far, bacteriology has not conclusively shown the nature of the infection. It is clear that in cases of influenza or influenzal pneumonia three organisms, or groups of organisms, are more or less constantly present—the bacillus of Pfeiffer, the pneumococcus, and the streptococcus. The outstanding fact which arises from Dr. Logan's work on the bacteriology of the Edinburgh cases is the multiplicity of types and subgroups of the organisms present. Even Pfeiffer's bacillus is not one, but comprises a group of organisms. Bacteriological data such as Dr. Logan gives militate strongly against the likelihood of an effective anti-serum being produced in the immediate future. The relation of the Pfeiffer to the Bordet Gengou bacillus of whooping-cough was referred to by Dr. Ford Robertson,

and although it raises a side issue the point is a suggestive one. These two organisms resemble each other very closely from a bacteriological standpoint, and it must be the experience of many physicians that it is sometimes most difficult to decide, especially in an adult who has had whooping-cough as a child, whether an irritating, paroxysmal, spasmodic cough is "post-influenzal" or true whooping-cough. Certainly the resemblance between whooping-cough with an ill-developed whoop and some cases of influenzal catarrh is very great.

The outstanding question at present with regard to the etiology of influenza—the part played by filter-passing organisms—was barely touched on in the discussion. It will be critically reviewed in the next issue of the *Journal*. Another point raised, which has wider implications than the etiology of influenza, is the possible effect of the deficiency in vitamines of such butter substitutes as the vegetable fats, which were so largely used as butter substitutes during the war. The study of these vitamines has hardly begun, yet already it foreshadows a great advance in the scientific application of dietetics.

So far as the treatment of influenza is concerned, no definite proof of the efficacy of vaccines was adduced. Dr. Porter's experience with phenol certainly appears to warrant a more extended trial of that remedy. For the rest, it does not appear that any advance has been made in practical therapeutics; particularly if pneumonia develops, most will agree with Dr. James that the problem is heartbreaking. Apart from the direct sequelæ, the more important of the remoter consequences of influenza are seen in the lighting up of tuberculosis, and in the production of maladies of the nervous system. Acute tuberculosis is not very infrequently seen after influenza, yet it is interesting that the epidemic did not seem to bear hardly on the inmates of sanatoria, nor, indeed, is there any great tendency for the disease to spread in well-ventilated wards. It would seem from this, that the infection, like that of measles, does not spread very far from the person affected, and also that fresh air is one of the best prophylactics.

The nervous complications of influenza have long been recognised as common and serious. The late Sir Thomas Clouston used to speak of it as a disease which lowered the nerve tone of a community, as was shown by an increase in mental disease after the epidemics of 1899-94, and his successor, Dr. Robertson, has the same tale to tell. What, if any, relation subsists between influenza and lethargic encephalitis is not known; the coincidence of the two diseases in epidemic form is remarkable, and demands elucidation. The possibility that both may be due to filter-passers, the occurrence of meningeal and lethargic symptoms in many cases of influenza, and the undoubted prevalence during the past year of sudden deaths of young adults with acute cerebral symptoms are curious facts which must have struck even the

most superficial. Toxic psychoses, too, have unquestionably been far from rare during the recent epidemics, taking the form of mania, confusion, or stupor. It is too soon, yet, to attempt to collate recent work on influenza, but the disease has been the subject of such intense study from all sides that we feel justified in believing that many aspects of the disease which are still obscure will soon be unveiled to us.

Appointments.

THE following appointments have been made to the Honorary Staff of the Royal Infirmary:

As Assistant Physician—Charles M'Neil, M.A., M.D., F.R.C.P.(Edin.). As Assistant Surgeons—John Fraser, M.C., M.D., M.Ch., F.R.C.S.(Edin.); James M. Graham, M.B., M.Ch., F.R.C.S.(Edin.); Alexander Pirie Watson, O.B.E., M.A., M.B., Ch.B., Ch.M., F.R.C.S.(Edin.); and Frank E. Jardine, M.B., Ch.B., F.R.C.S.(Edin.).

Anti-rabic Treatment in Scotland.

THE Local Government Board have made arrangements with Professor Ritchie, Royal College of Physicians' Laboratory, 2 Forrest Road, Edinburgh, whereby specific anti-rabic treatment can be given in Edinburgh. It will be necessary for those under treatment to obtain accommodation for themselves in Edinburgh; but arrangements have been made for exceptional cases requiring institutional treatment to be received into the wards of the Royal Infirmary.

Royal College of Surgeons of Edinburgh.

AT the meeting of the Royal College of Surgeons of Edinburgh held on the 19th May, the following gentlemen having passed the requisite examinations were admitted ordinary Fellows:—

Douglas Hume Bett, M.B., Ch.B.(New Zealand), M.R.C.S.(Eng.); Charles Bouck, M.B.(Toronto), Captain, C.A.M.C.; Oswald Tilson Dinnick, M.B.(Toronto), M.R.C.S.(Eng.); Haji Hyderali Khan, L.M.S.(Bombay), M.R.C.S.(Eng.); Arthur Vincent Meehan, M.B., Ch.B.(Sydney); James Thomas Wall, M.D., C.M.(Univ. M'Gill), M.R.C.S.(Eng)., Captain, C.A.M.C.

At the same meeting the Bathgate Memorial Prize, consisting of bronze medal and set of books, was, after a competitive examination in Materia Medica, awarded to Mr. William Frederick George Radford, Leith.

RECENT RESEARCHES ON THE ETIOLOGY OF CHOLERA.*

By Lieutenant-Colonel E. D. W. GREIG, C.I.E., M.D., D.Sc., I.M.S.

I have selected cholera as a subject for consideration to-day, as I have recently had special opportunities of studying its problems whilst conducting a research on its etiology in India from 1912 to 1916, and I propose to give a short summary of the newer conceptions which emerged from the inquiry.

Brief Summary of Cholera Pandemics.

In the first place it is of interest to follow briefly the course of one of the great pandemics across the world from India to Europe. There have been seven pandemics.

First Pandemic (1826-37).

It was preceded, as is usually the case, by epidemics in India (1821-23). Starting from Calcutta in April 1826, it proceeded up the Ganges Valley, touching Benares, Cawnpore, Delhi. Quitting India, it reached Afghanistan in 1828. There it divided into two branches—one advanced into Persia, Khorassan and Teheran (1829); then it continued its course into southern Russia, reaching Orenburg, via Bokara and Khiva; there it stopped in the same year. The other branch also set out from Persia, reached Baku on the shores of the Caspian, then Tiflis and Astracan (1830). It ascended to the north in Russia, attacking Saratoff, then Nidji-Novgorod, then Karkoff, and finally the old capital of Russia, Moscow. Continuing its route it proceeded south into Bulgaria and west into the rest of Russia (1830). Grodno, Vilna, Warsaw and Riga, and all the province of Archangel were affected; then it reached St. Petersburg. Poland in turn was invaded (1831). It continued to extend on all sides into Sweden, Germany (Berlin included), Austro-Hungary (Vienna included) (1831). From the Gulf of Riga it was transported into England, chiefly Newcastle, Gateshead, and Edinburgh (1831).

Meanwhile, concurrently with the above, another epidemic started from Mecca (1831); the infection had been imported from India in the same year. From there it extended to the ports of Egypt—Suez and Alexandria—and thence to Asia Minor; Turkey

* A lecture delivered to the class of Clinical Medicine, Edinburgh University, at the request of Professor Sir Robert Philip, on 16th May 1919.

and Galicia were attacked in 1832. From Egypt it passed to England and attacked London, then Ireland (1832), then France. From Ireland the disease was transported to America, firstly to Canada (Quebec and Montreal), then New York was attacked and it spread throughout the United States (1832). From England it was carried to Portugal and Spain (1832). From Spain it spread to the Spanish colonies, Havana and Mexico. From the south of France it extended to Italy (1836). From the Peninsula it reached Sicily and Malta (1837). Before its final extinction in 1837 there was a recrudescence in Europe.

Second Pandemic	from		1840-49	10 Years.
Third	„	„	1853-56	4 „
Fourth	„	„	1863-68	6 „
Fifth	„	„	1868-73	6 „
Sixth	„	„	1881-85	5 „
Seventh	„	„	1892-94	3 „

In the last (seventh) pandemic of cholera the speed of transport had greatly increased, taking months instead of years to accomplish the journey.

Effect of Speeding-up of Transport on the Spread of Cholera.

In the future, with greatly increased speed of transport from the East to Europe—an aeroplane journey from England to India in about four days is now a *fait accompli*—we may expect a corresponding increase in the rate of spread of cholera epidemics. Further, on the establishment of this mode of transport, Europe will not have the important warnings which it had in the days of slower transport, namely, the news of the occurrence of epidemics at points on the journey from the East, thus enabling special measures to be taken in time against the threatened invasion: with a fast air service, of course, no such warnings will be given. This aspect of the cholera problem is an extremely important one, requiring very serious consideration. It is essentially an international question of great moment. We can hardly regard any part of the earth's surface as being now separated.

That cholera is a grave matter for India is seen from the number of deaths caused by it. In a period of thirteen years (1900-12) the

Minimum number of deaths in one year was 193,457 (1904).
Maximum „ „ „ 850,984 (1900).

Pilgrim Centres in India Play an Important Part in the Production and Spread of Cholera.

The conditions at the great places of pilgrimage are particularly favourable for the distribution of cholera. During the course of my investigations I studied the problem during the great pilgrim gathering at the town of Puri in which is the temple of the historic Jugganath. The town lies in the epidemic area of cholera on the coast just south of Calcutta. During the festival a great influx of people takes place by train and road from all parts of India.

To give some idea of the enormous numbers of persons moving to and from Puri during the Car Festival, I give in the following table figures showing the arrivals and departures by train, day by day, during the festival of Nutan Kalebar in the month of July 1912.

Table No. I.

Date.	Arrivals.	Weekly Total.	Departures.	Weekly Total.	Remarks.
1st	938	...	535	...	
2nd	1,136	...	463	...	
3rd	951	...	392	...	
4th	1,120	...	530	...	
5th	1,005	...	482	...	
6th	1,184	...	425	...	Arrival of special trains.
7th	1,508	7,842	502	3,359	
8th	2,325	...	369	...	Two.
9th	3,075	...	558	...	Three.
10th	4,770	...	408	...	Four.
11th	6,419	...	405	...	Four.
12th	10,804	...	449	...	Nine.
13th	15,875	...	483	...	Eleven.
14th	16,946	60,214	350	3,022	Nine.
15th	24,663	...	300	...	Eleven.
16th	20,854	...	10,240	...	
17th	14,896	...	17,675	...	
18th	3,181	...	15,140	...	
19th	2,108	...	14,295	..	
20th	2,183	...	13,965	...	
21st	2,285	70,170	11,627	83,242	
22nd	4,689	...	12,585	...	
23rd	3,156	...	2,212	...	
24th	3,915	...	5,548	...	
25th	1,216	...	5,520	...	
26th	1,234	...	4,896	...	
27th	1,014	...	4,071	...	
28th	1,042	16,311	2,561	37,391	
29th	1,540	...	2,427	...	
30th	1,542	...	2,910	...	
31st	1,530	4,612	1,347	6,684	
Grand Total	...	159,149	...	133,698	

In addition to the pilgrims who came by train a large number also poured into Puri by road. The population of Puri is roughly 50,000. It is estimated that at least 300,000 pilgrims were present on the day of the car pulling.

Cholera epidemics almost invariably occur during the festival. Whilst at Puri I examined bacteriologically a number of cholera convalescents just before their departure for their villages. The results are shown in the following table:—

TABLE No. II.

No.	Name.	Age.	Sex.	Caste.	Date of Admission.	Date of Discharge.	Date of Examination of Stool.	Character of Stool.	Presence or Absence of Cholera Vibrio in Stool.
1	Shamacharan	32	M.	H.	20-7-12	23-7-12	22-7-12	Liquid	—
2	Mainabewa	55	F.	H.	Ditto	25-7-12	24-7-12	Liquid	+
3	Lakmidas	40	M.	H.	18-7-12	2-8-12	Ditto	Semi-fluid	—
4	Anchi	12	M.	H.	19-7-12	25-7-12	25-7-12	Liquid	—
5	Mahadaya	45	F.	H.	23-7-12	27-7-12	26-7-12	Do.	—
6	Rakhaldas	40	M.	H.	26-7-12	3-8-12	27-7-12	Do.	—
7	Tarabewa	42	F.	H.	26-7-12	29-7-12	28-7-12	Do.	+
8	B. Dass	28	M.	H.	23-7-12	30-7-12	29-7-12	Do.	—
9	Bibaran Das	25	M.	H.	25-7-12	Ditto	Ditto	Do.	—
10	Bhupa Singh	25	M.	H.	18-7-12	4-8-12	Ditto	Do	—
							1-8-12	Fluid	+
11	Laksmi	45	M.	H.	18-7-12	2-8-12	29-7-12	Do.	+
12	Iswari	12	M.	H.	...	4-8-12	Ditto	Do.	+
							4-8-12	Do.	+
13	Wari Bi	38	F.	H.	28-7-12	2-8-12	31-7-12	Do.	—
							1-8-12	Do.	—
14	Thakur Das	40	M.	H.	28-7-12	1-8-12	31-7-12	Do.	—
							1-8-12	Do.	—
15	Basudeva	16	M.	H.	29-7-12	4-8-12	31-7-12	Liquid	—
							3-8-12	Do.	—
16	Gopal Panda	35	M.	H.	29-7-12	1-8-12	31-7-12	Fluid	—
17	Sungani	40	M.	H.	27-7-12	Ditto	Ditto	Soft	—
18	Sibram	32	M.	H.	25-7-12	4-8-12	31-7-12	Do.	—
							1-8-12	Fluid	—
19	B. K. Mukerji	36	M.	H.	30-7-12	1-8-12	1-8-12	Do.	—
20	Kurpa	32	M.	H.	29-7-12	6-8-12	2-8-12	Do.	+
							5-8-12	Do.	+
21	Bramanando	32	M.	H.	Ditto	4-8-12	2-8-12	Do.	+
							4-8-12	Do.	+
22	Remeswar	25	M.	H.	19-7-12	8-8-12	3-8-12	Soft	+
							6-8-12	Do.	+
23	Jumma Das	45	M.	H.	2-8-12	6-8-12	4-8-12	Fluid	—
							5-8-12	Do.	—
24	Sudarsan	39	M.	H.	Ditto	5-8-12	4-8-12	Do.	+
							5-8-12	Do.	+
25	Ruki	35	F.	H.	19-7-12	6-8-12	5-8-12	Soft	—
26	Sukhali	60	F.	H.	20-7-12	6-8-12	5-8-12	Fluid	+
27	Janki	60	F.	H.	22-7-12	3-8-12	3-8-12	Soft	+
28	Narain	50	M.	H.	11-8-12	18-8-12	18-8-12	Fluid	—
29	Rajani	42	M.	H.	12-8-12	Ditto	Ditto	Do.	—
30	Chinta	50	M.	H.	15-8-12	Ditto	Ditto	Do.	—

From this table it will be seen that 30 per cent. of the pilgrims about to return to their villages are excreting the cholera vibrio in their stools. The possibility of these pilgrims spreading the infection far and widely will be readily understood after a study of the map which is given in Fig. 1.

These pilgrims travel chiefly by rail and they reach the most distant villages in a few days, and, consequently, are sources of cholera infection in the villages where fresh epidemics occur, and the convalescents from these villages proceed to other pilgrim centres and again cause fresh outbreaks there, and so the vicious circle is maintained.

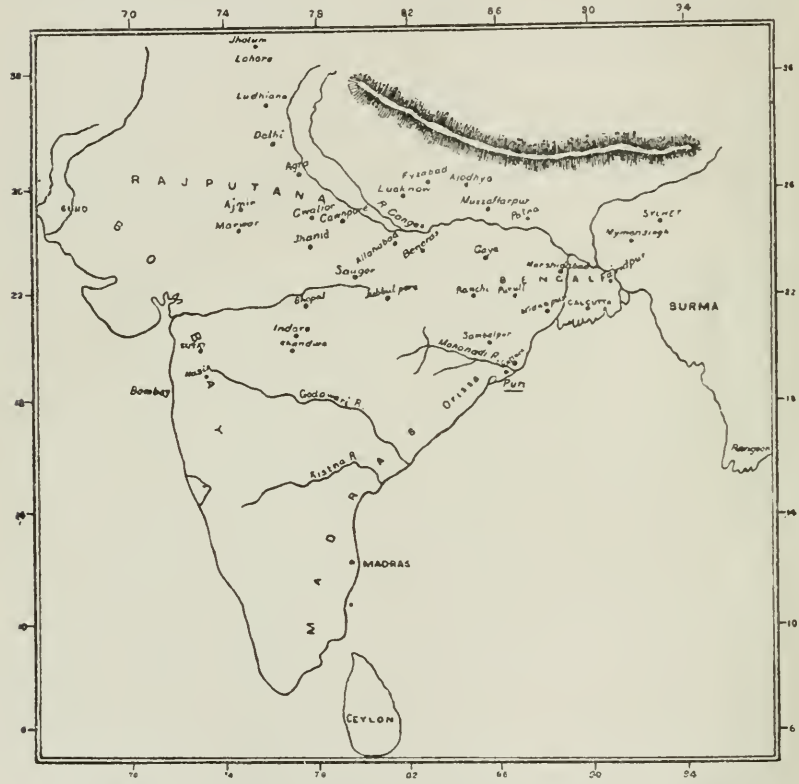
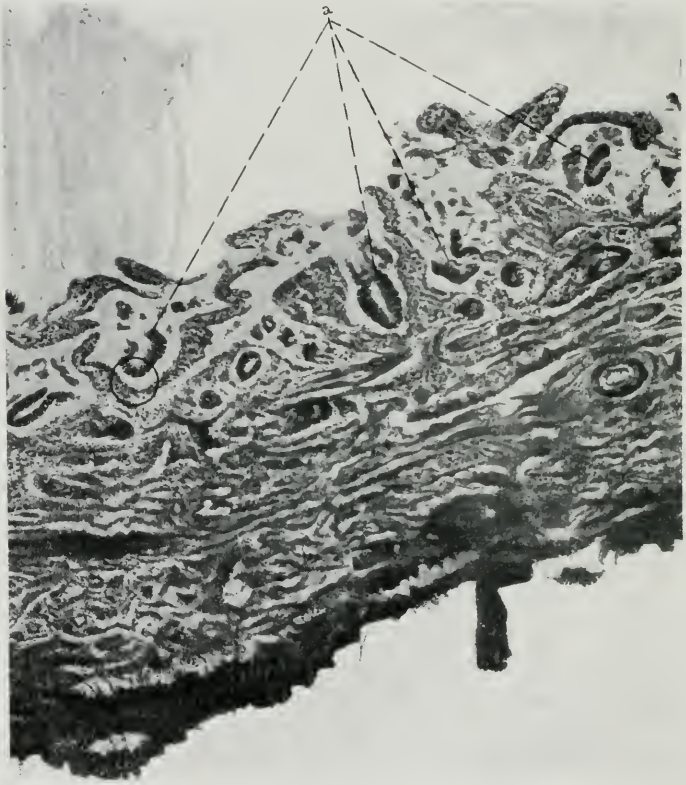


Fig. 1.—Map showing Places in India to which Cholera Convalescents from Puri (Jugganath Pilgrimage) Returned.

The Carrier Problem in Cholera.

From the foregoing it will be seen that man plays a most important part in the spread of cholera; he harbours the cholera vibrio for long periods and is always the initial source of infection: water supplies, food supplies, etc., receive the organisms of the disease from him. Consequently an accurate knowledge of the relation of the cholera vibrio to man is of paramount importance.

PLATE I.



Section of the Wall of a Gall-bladder from a Cholera Case (Low Power).

Only small portions (*a*) of the epithelial layer remain. The submucous layer shows cellular exudation. A portion of mucus is seen attached to the surface; this contained cholera vibrios.
The portion inside the circle is shown in Plate II.

At the time I commenced the investigation of cholera it was generally considered that the cholera vibrio was confined to the alimentary tract of man, but as the investigation proceeded it became evident that this conception was incomplete, because bacteriological examination of the organs of cholera cases made shortly after death showed that it had a much wider distribution in the tissues. The results of this observation in one case are shown in the following table:—

TABLE No. III.

Organs Examined Bacteriologically.	Presence or Absence of Comma Bacillus.
1. Left lung	+
2. Right lung	+
3. Wall of left ventricle of heart	+
4. Liver	+
5. Gall-bladder—	
(*a*) Portion of wall	+
(*b*) Bile.	+
6. Spleen	+
7. Pancreas	+
8. Left kidney	+
9. Right kidney	+
10. Lymphatic gland (mesenteric)	+
11. Urinary bladder—	
(*a*) Urine	+
(*b*) Portion of wall	+
12. Cerebrum	+
13. Choroidal plexus	+
14. Fluid in right lateral ventricle	−
15. „ left „ „	−

PRESENCE OF THE CHOLERA VIBRIO IN THE GALL-BLADDER.

In 271 post-mortem examinations in which the bile was examined bacteriologically the vibrio was found to be present in eighty, and in twelve of these definite signs of cholecystitis were noted with the naked eye.

My observations on this point were subsequently confirmed by American observers in the Philippines. A drawing is given of a section of the wall of a gall-bladder from a cholera case (Plate No. I.). It shows that the epithelial layer has been for the most part destroyed. At one point some of the mucus is seen on the surface of the epithelial layer, and in this the cholera vibrios were present. In the subepithelial layers there is some cellular reaction. Another drawing is given (Plate No. II.) which shows a

portion of the same specimen under a higher magnification. It shows the presence of cholera vibrios quite definitely in the deeper layers of the wall of the gall-bladder. The finding of the cholera vibrio in the bile of cholera cases was an important observation because it furnished, for the first time, accurate knowledge regarding the mechanism of the carrier state in cholera. In the bile the vibrio finds much more favourable conditions for its continued life than it does in the intestines. The bile forms a suitable medium for the growth of the vibrio, and in the gall-bladder there is an absence of inhibiting organisms. Some organisms found in the intestine are particularly unfavourable to the development of the vibrio, *e.g.* B. pyocyaneus, B. proteus, and B. lactis aerogenes. In chronic carriers the vibrio lurks in the gall-bladder for long periods, probably for years; during all that time they escape into the intestine and thence to the outer world, where they start fresh infections. This has been clearly demonstrated in epidemics which have been systematically investigated by modern methods of research. It proves how important the carrier is, and how essential is the control of infected individuals: the latter is a very difficult problem to solve. The difficulty in detecting a cholera carrier will be understood when it is realised that the cholera vibrio is excreted intermittently in the stools. Daily examinations over a prolonged period were made of convalescent cholera cases. The results of the examinations in one case are given in the following table:—

TABLE No. IV.

Date of Examination of Stools.	Widal Reaction Cholera Vibrio.	Presence or Absence of Cholera Vibrios in Stools.	Character of Stools.	Body Weight in lbs.
July 21st . .	...	−	...	110
August 1st .	...	+	...	...
,, 3rd .	...	+	...	...
,, 4th .	...	−	...	...
,, 5th .	...	−	...	...
,, 6th .	...	−	...	...
,, 11th .	...	−	...	...
,, 12th .	...	−	...	...
,, 18th .	...	−	...	95
,, 19th .	...	−	...	...
,, 20th .	...	−	...	...
,, 21st .	...	−	...	...
,, 22nd .	...	−	Fluid stool	...
,, 23rd .	...	−	Ditto	...

PLATE II.

Portion of Wall of Gall-bladder of Cholera Case (High Power).

Cholera vibrios seen on surface of epithelial layer and in submucosa, some of the cholera vibrios are swollen.

a, Portion of epithelial layer.
b, Submucosa.
c, Cholera vibrios.

Carrier State Produced Experimentally.

The problem was also studied experimentally. If living cultures of the cholera vibrio are injected into the ear vein of a rabbit the organisms pass into the bile, from which they can be recovered in pure culture, and they produce definite pathological changes in the gall-bladder. A drawing of a section of the wall of the gall-bladder of an experimental animal was shown at the lecture; it is not reproduced. The epithelial layer has been damaged at one place and there is a considerable amount of round-celled infiltration in the subjacent layers. The vessels of the wall are congested and under a higher power vibrios are seen to be present in them. If intravenous injections are repeated more marked changes are produced in the gall-bladder. A drawing was shown of the gall-bladder and liver of an experimental animal. In addition to signs of cholecystitis the formation of gall-stones had occurred, and when a culture was made from the gall-stones the cholera vibrio was recovered in pure growth. The vibrios have formed a nucleus on which the stone is produced. This is an interesting observation, but a result of greater interest and importance is that in a certain proportion of the experiments the rabbit has been converted into a chronic carrier. I have recovered the vibrio from the gall-bladder of rabbits which had received the last intravenous injection of living cholera vibrios a year previously. The experimental production of the carrier state is an important advance, because it enables investigators to study with greater precision the various problems connected with it.

Presence of the Vibrio in the Lung.

During early convalescence pneumonia is a not infrequent and fatal complication of cholera. On post-mortem examination in such cases small patches of consolidation are found. A drawing of a section of such a patch of consolidation was shown at the lecture. The alveoli are filled with round-celled exudation. In this exudation under a higher power the cholera vibrio can be seen microscopically and recovered in pure culture, thus showing that the organism is capable of penetrating the lung tissue and giving rise to pathological changes.

Presence of the Cholera Vibrio in the Urine.

I have examined the urine bacteriologically in fifty-five cases of cholera and was able to cultivate the vibrio eight times. In

two of the eight cases the patients had quite recovered and were fit for work. This observation, as you will readily understand, has an important bearing on the question of the prevention of cholera.

Bacteriological Examination of the Blood in Cholera.

In a number of cases cultivations were made from the blood in cholera cases, but always with negative results. Other observers have had similar results. It is not improbable that the vibrios are carried mainly by the lymph-stream.

Modern Conception of the Pathology of Cholera.

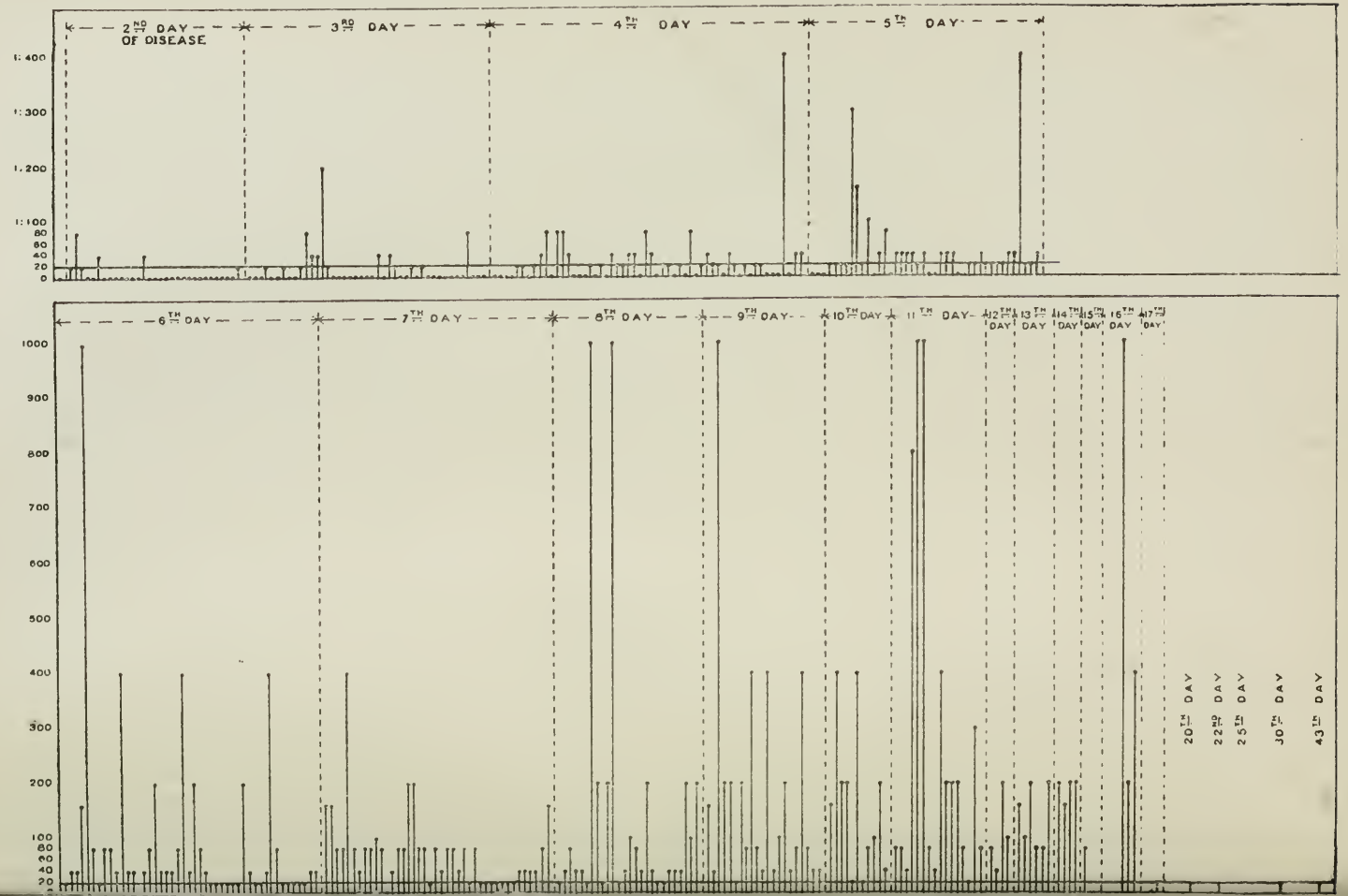
From what has been said it will be seen that the modern conception of the pathology of cholera, based on recent researches, is that it consists in a generalised infection, the starting-point being the alimentary tract, in this respect closely resembling typhoid and paratyphoid fevers. Further, it will be seen that in the light of the new knowledge we have had to alter very materially our views of the etiology and pathology of cholera. It is important that these facts should be clearly grasped, as this knowledge places in the hands of the profession weapons of great precision in dealing with the prevention and treatment of cholera on scientific lines.

Agglutinins in the Blood of Cholera Cases.

Having considered the nature of the infection in cholera, it will be of interest next to see how the human organism responds to this generalised infection. A study of the antibody content—and more particularly the agglutinin content—of the blood gives us fresh knowledge on this question. In a number of cases the agglutinin content of the blood was estimated daily from the first day of the attack continuously into convalescence. The results have been plotted out and the curve is reproduced (Chart No. 1). In the first place it must be noted that normal human serum will agglutinate the cholera vibrio in a dilution of 1 in 20, hence reactions up to this dilution only cannot be regarded as evidence of the presence of cholera agglutinins. It will be seen that the reactions in higher dilutions begin to appear as early as the second day. The agglutinin titre of the serum rises markedly on eighth, ninth, and fifteenth days.

CHART 1.—Showing the Agglutination Titre of Cholera Cases Day by Day from the First to the Eighteenth Day of the Disease.

Note.—The sera of normal persons may agglutinate the cholera vibrio in dilutions on and below the horizontal line.



Agglutinins in Non-fatal Cases of Cholera.

In a series of cases which made a rapid and satisfactory recovery the agglutinin contents have been plotted out and the curve is shown in Chart 2. The agglutinin titre is high, the quantity of agglutinin produced is very considerable.

Agglutinins in Fatal Cases of Cholera.

On the other hand, the examination of the agglutinin content in fatal cases of the disease affords a marked contrast. The quantity produced is practically nil, as will be seen in Chart 3 which is reproduced. Thus we see that the determination of the agglutinin content of the blood is of considerable value in the prognosis of cholera. The humoral reactions yield important information also for the solution of problems connected with prophylactic inoculation.

Agglutinins Produced Experimentally.

A very important method for the identification and classification of vibrios is by the use of a high titre agglutinating serum. This is obtained by immunising rabbits with repeated intravenous injections of living cultures. The blood serum ultimately acquires a high specific agglutinating capacity. It is interesting to note that both animals whose agglutinin curves are reproduced (Chart 4, Figs. A. and B.) suffered from cholecystitis. Violle has shown that the injection of living vibrios directly into the gall-bladder of rabbits after ligaturing the cystic duct produced a high agglutinin content of the blood. If the cystic duct is not ligatured no antibodies are formed in the blood. It is not improbable that in animals treated with intravenous injections the cystic duct gets blocked by the production of gall-stones, which as we have seen form during the course of intravenous injections, and so bring about an analogous condition to that of ligature of the cystic duct.

Cholera-like Vibrios.

As I have just mentioned, the use of a high titre cholera agglutinating serum is of importance in the identification of the cholera vibrio (*vide* Chart 4). The bacteriological diagnosis of cholera is complicated by the presence in the stools of vibrios which have not got all the characteristics of the standard vibrio and differ from it in certain respects; thus the vibrios may not be agglutinated by a specific high titre serum, also they may have the

CHART 2.—Showing Agglutination Titre of Sera of Cholera Cases which made a Rapid and Satisfactory Recovery.

Note.—The quantity of agglutinins produced is considerable. Compare with Chart 3. The contrast is striking.

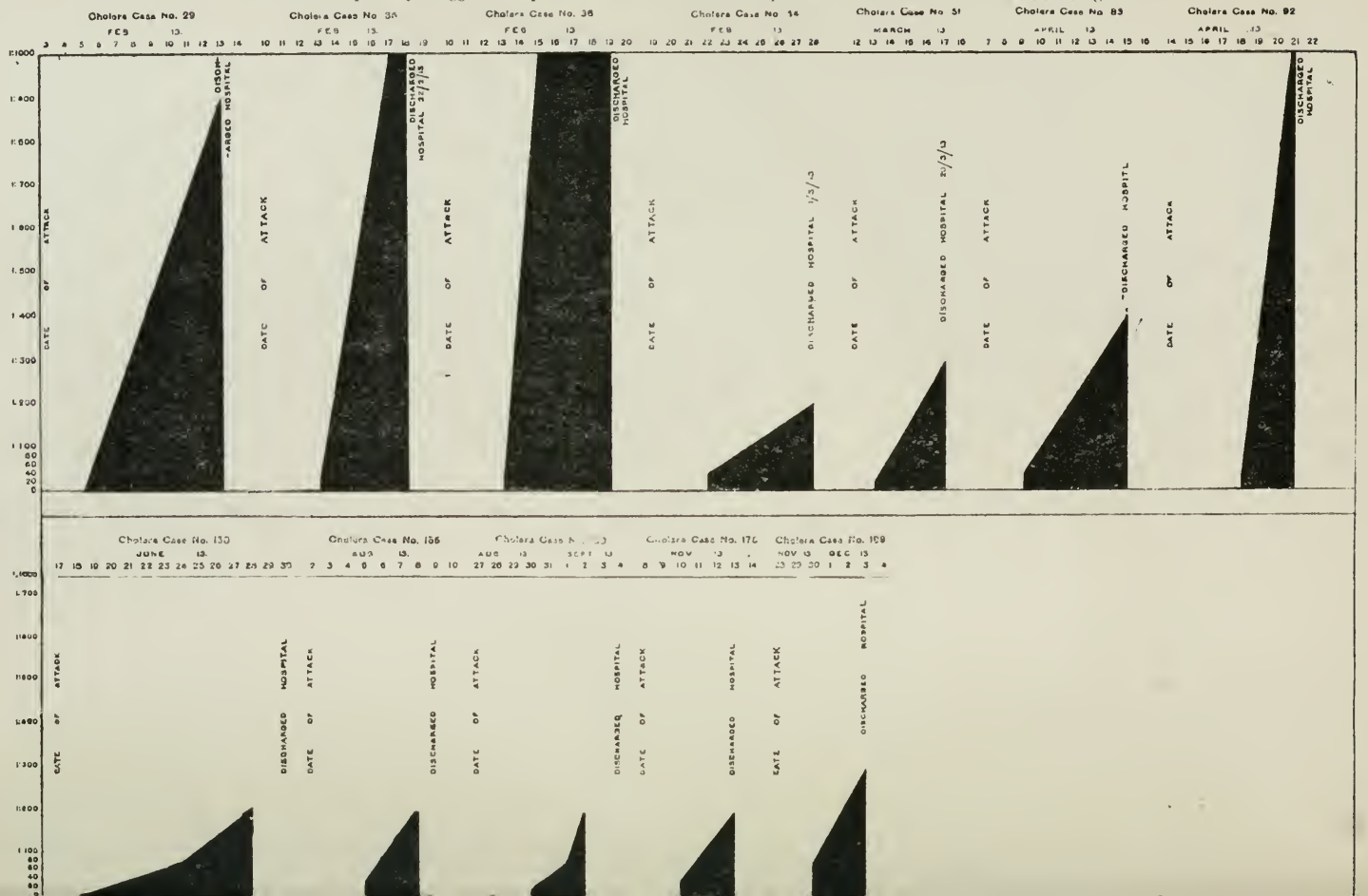


Chart 3.—Showing Agglutination Titre of Sera of Cholera Cases ending Fatally.

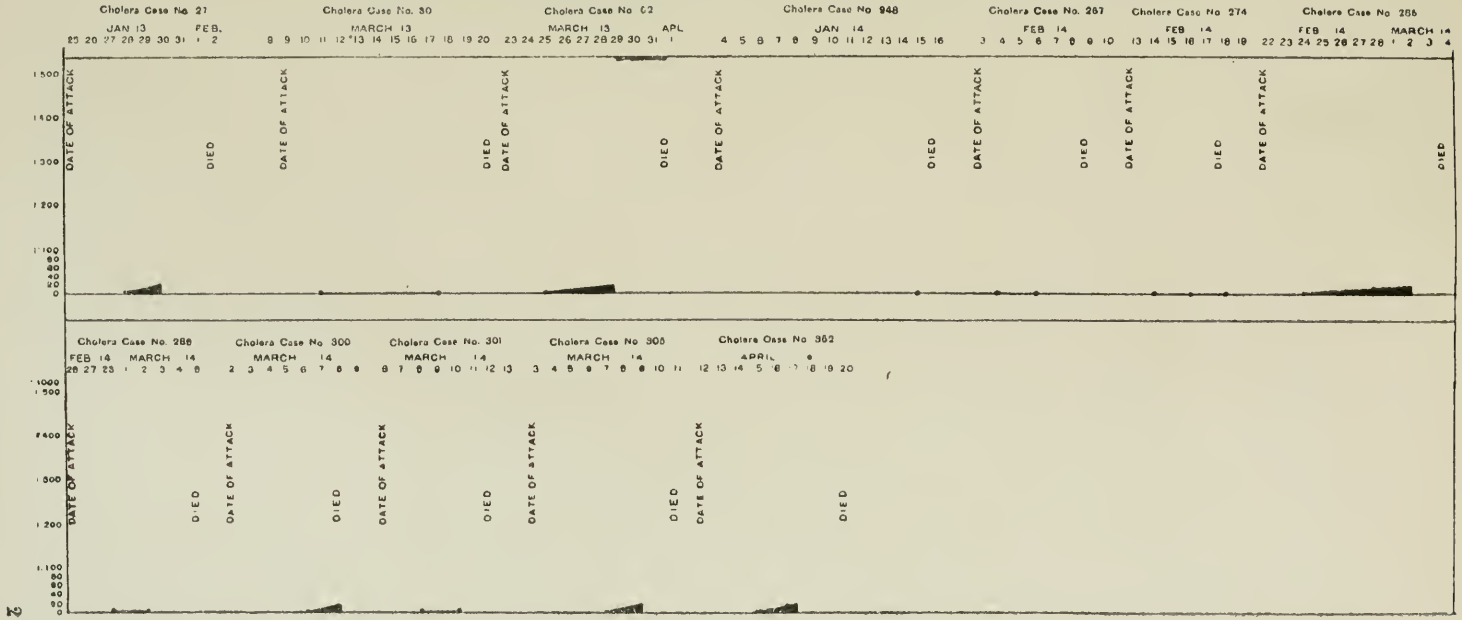


CHART 4.—Showing (1) Agglutination Curves of Serum of Rabbits (Immunised with Cholera-like Vibrios from Water) with these Strains and the true Cholera Vibrio : (2) Weight Curves in both Experiments.

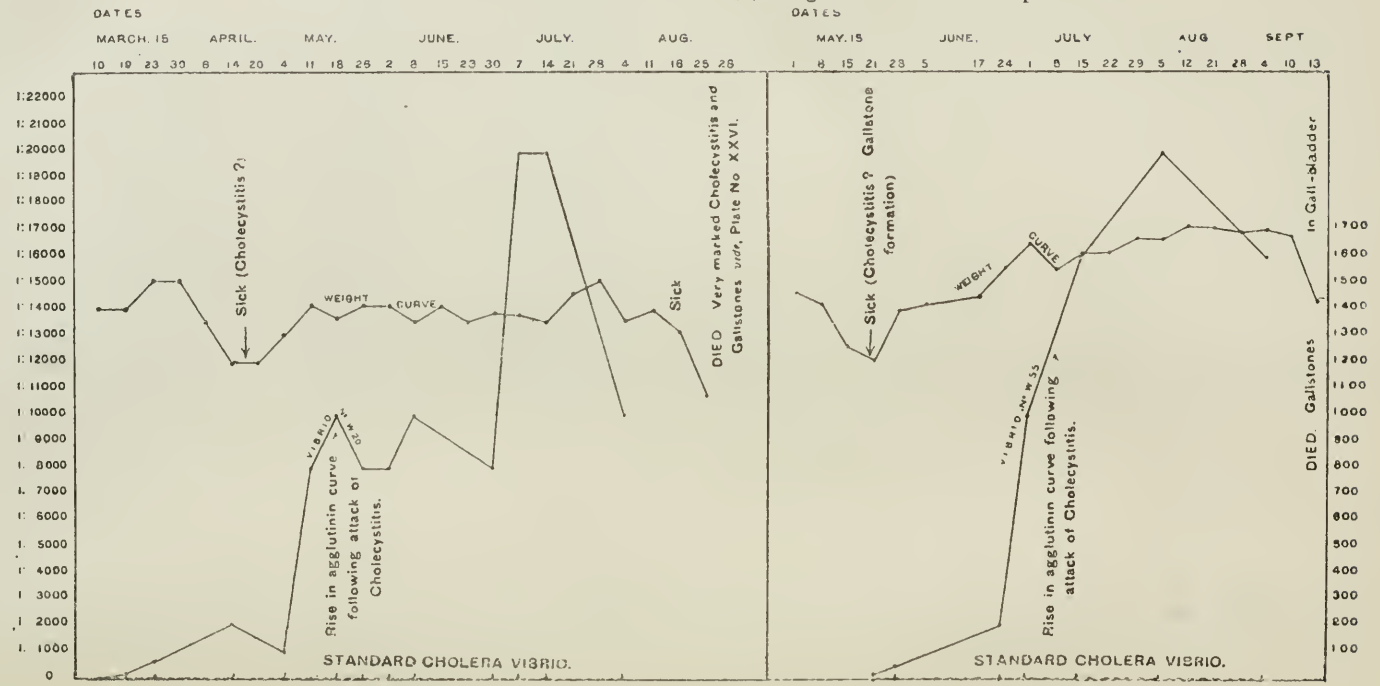


FIG. A.

Note.—That the agglutination titre rises rapidly after attack of cholecystitis (confirmed post mortem).

No agglutinins against the true cholera vibrio are produced, an important point in the differentiation of cholera and cholera-like vibrios.

FIG. B.

Results similar to those noted in Fig. A.

power of hæmolysing red blood corpuscles, which the standard strain has not. Such vibrios may have been originally: (1) True cholera vibrios which have lost certain attributes, or (2) harmless vibrios which have become partially "humanised." I examined the stools of cholera cases during the annual recrudescence of cholera in spring in Calcutta for several years. I found the same phenomenon each year, namely, when the epidemic was in the upward phase only the true cholera vibrio was found in the rice-water stools, but when it reached its zenith and was on the decline cholera-like vibrios began to appear along with the true cholera organism, and these forms increased in number as the epidemic drew to a close. I made a detailed study of the strains and the results have been fully dealt with in a series of publications in the *Indian Journal of Medical Research* during 1917. It is interesting to note that agglutinins for the cholera-like vibrio did not develop in the blood of patients harbouring these atypical forms, although, as we have seen, a considerable amount of agglutinins are produced in the blood of patients by the standard cholera vibrio. Cases harbouring these atypical forms of vibrio should be regarded, especially in times of cholera prevalence, as suspect.

Diagnosis of Cholera.

In reaching a diagnosis of cholera, especially in sporadic cases, evidence of three kinds must be considered, namely: (1) Epidemiological; (2) Clinical; (3) Bacteriological. It is not safe to label a case cholera on clinical grounds only, however typical the signs may be. Clinically cholera is a syndrome; that is, a collection of signs, none of which have specific value—even the combination has not. As regards the bacteriological diagnosis we have seen the difficulties in certain cases due mainly to (1) the intermittent discharge and (2) to the presence of pseudo-vibrios closely resembling the cholera vibrio.

Vitality of the Cholera Vibrio Outside the Human Host.

Having discussed the distribution, etc., of the organism in the human host it is of importance to determine the duration of the life of the vibro after it leaves man, because this has an important bearing on the question of reinfection.

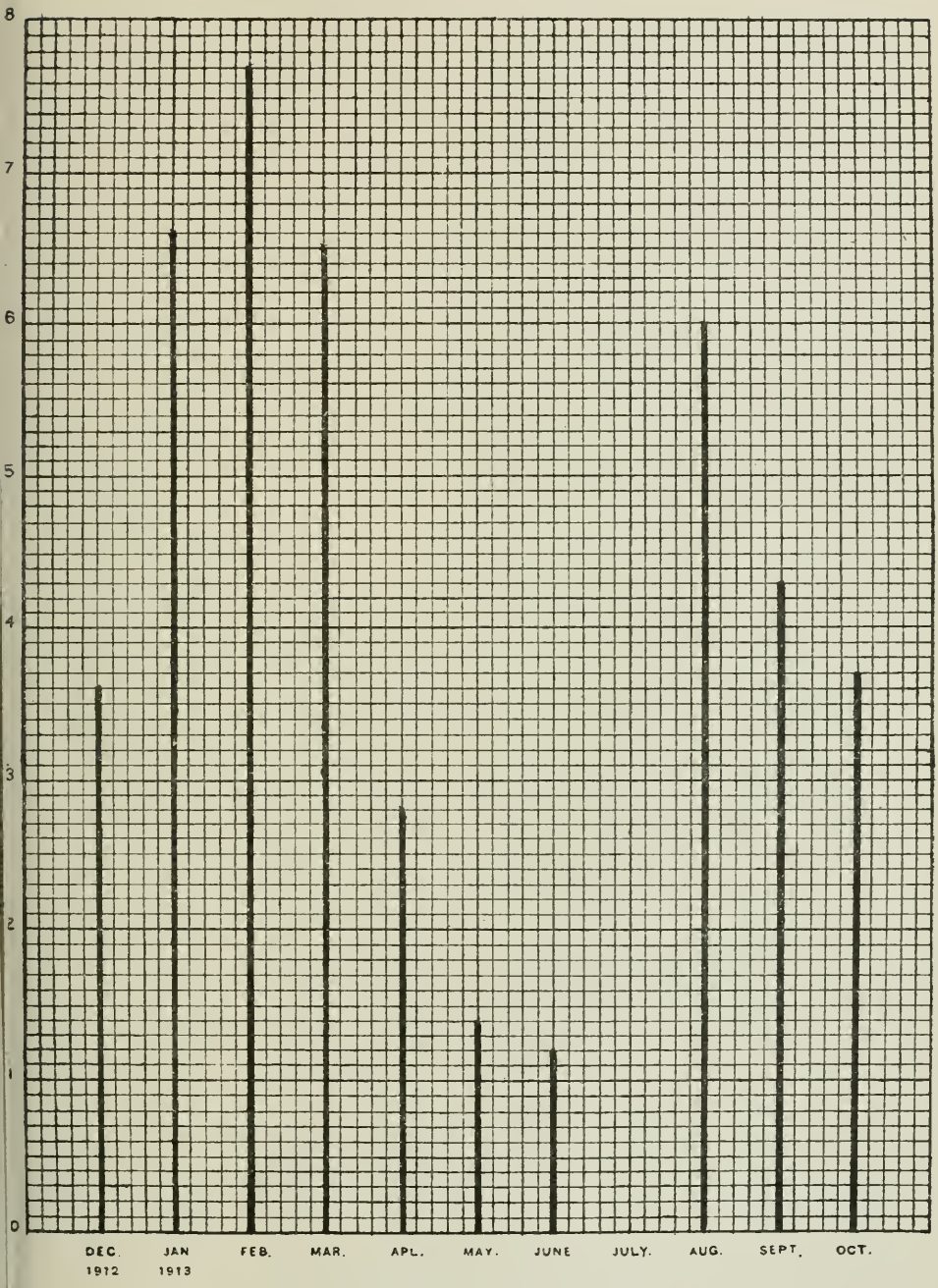
In the older observations on this question a fallacy occurs in the experiments, because in most instances old stock cultures of the cholera vibrio, which had been grown on artificial media for long periods, were used. Such cultures give erroneous results as

regards longevity of the organism. It is necessary to employ "uncultured" strains of the vibrio for such experiments; that is, those which have never been grown on artificial media. In my experiments I used the vibrios contained in the rice-water stools straight from the patient. They were kept in flasks at room temperature away from the light. The number of organisms present in the stools was counted daily until the vibrio was no longer recovered. The results of some of the observations are given in the following table:—

TABLE No. V.

Serial No.	Registered No. of case.	Date of Passing Stools.	Date of Examination.	Number of Cholera Vibrios per c.c. of Rice-Water Stool.	Mortality amongst Cholera Vibrios Populating 1 c.c. Rice-Water Stool.
3	I. 165	25–9–13	25–9–13	850,000,000	850,000,000
			26–9–13	98,000,000	in 5 days.
			27–9–13	8,000,000	
			29–9–13	+1 c.c.	
			30–9–13	−10 c.c.	
			1–10–13	−20 c.c.	
			2–10–13	− remainder of stool.	
4	I. 166	10–10–13	10–10–13	500,000,000	500,000,000
			11–10–13	15,000,000	in 3 days.
			12–10–13	+1 c.c.	
			13–10–13	−1 c.c.	
			14–10–13	−5 c.c.	
			15–10–13	−10 c.c.	
			16–10–13	−20 c.c.	
			17–10–13	− remainder of stool.	
5	I. 169	12–10–13	12–10–13	2,000,000,000	2,000,000,000
			13–10–13	300,000,000	in 4 days.
			14–10–13	40,000,000	
			15–10–13	+1 c.c.	
			16–10–13	−5 c.c.	
			17–10–13	−10 c.c.	
			18–10–13	−20 c.c.	
			19–10–13	− remainder of stool.	
6	I. 170	13–10–13	13–10–13	700,000,000	700,000,000
			14–10–13	54,000,000	in 4 days.
			15–10–13	6,000,000	
			16–10–13	+1 c.c.	
			17–10–13	−10 c.c.	
			18–10–13	−20 c.c.	
			19–10–13	− remainder of stool.	

CHART 5.—Showing that Temperature has a most Important Bearing on the Extra-corporeal Life of the Cholera Vibrio. In the colder months (the critical cholera months) the life is longer than during the hot season.



Mean Average Temperature of Calcutta = 79° F.
,, Maximum (May) ,, ,, = 102° F.
,, Minimum (Jan.) ,, ,, = 48° F.

It will be noted that from the moment the cholera vibrio leaves the host the organisms begin to die with great rapidity; hence it becomes evident that the duration of the life of the organism outside the human body is much shorter than its life inside the host—man or experimental animal. This observation is of great epidemiological significance.

Next it was noted that temperature had a most important bearing on the extra-corporeal life of the cholera vibrio. Chart 5 shows the duration of life of the cholera vibrio during each month of the year.

It will be seen that during the colder months in Calcutta the life of the cholera vibrio was longer than during the hot months, consequently the critical months in Calcutta as regards cholera infection are the colder months, because the chances of infection are increased considerably by the prolongation of the extra-corporeal existence of the cholera vibrio. It is noteworthy that these critical months immediately precede the annual recrudescence of cholera in Calcutta, which takes place in the months f February, March and April.

The facts that we have considered lead to the conclusion that an essential measure in an intensive anti-cholera campaign is the detection of the infected person, especially the carrier. As we have seen, this is not an easy matter; but although the difficulties are great, every effort should be made to overcome them by perfecting and rendering more precise the machinery for dealing with this question. It is further essential that all measures should be based on the results of scientific research.

The results of my investigations on cholera have been published in the *Indian Journal of Medical Research* in a series of papers from 1913. In this lecture certain aspects of the work have been discussed, and those desiring fuller information should refer to the original articles.

A FIELD AMBULANCE IN GALLIPOLI, EGYPT, PALESTINE, AND FRANCE.

By JAMES YOUNG, D.S.O., M.D., F.R.C.S.(Edin.),
Lieutenant-Colonel, R.A.M.C.

VIII. Dueidar.

23rd April 1916.

The first months of our new life were on the whole uneventful. There was no fighting on the big scale. Nothing but small encounters. At the end of March a detachment of the ambulance set out with a party of Yeomanry on a flying column into the desert and they returned some days after, tired and worn. They were all mounted for the occasion and, from evening of one day till the afternoon of the next, they covered forty miles across scrub and soft sand. It was a test of endurance for both man and beast, especially the latter. They came into touch with the Turks and retired after obtaining the information for which they had set out.

Some weeks after this there occurred one of the most thrilling incidents in the whole of the fighting in Sinai. It was on Easter Sunday, the 23rd April, at Dueidar, an oasis in the desert about thirteen miles east of the Suez Canal. The general story has already been told in the official and non-official accounts.

A small party of the Royal Scots Fusiliers held Dueidar as an outpost and were protected by redoubts situated some hundreds of yards in front of the clump of palm trees that marked the oasis. The main body was camped amongst the trees.

In the early morning hours, taking advantage of a thick mist, which enveloped everything, the enemy burst upon our fellows without warning and were soon within a few yards of the redoubts and the palm trees. In spite of the surprise of the attack, which was delivered by a force calculated at being seven or eight times greater than the outpost party, and in spite of the deadly rifle fire at close range, our men put up a gallant fight for several hours and held up the Turk till they were relieved by another company.

This reinforcing party marched hot-foot over the soft burning sand, covering a distance of seven miles in the incredibly short time of two hours, and then, instead of resting after their perspiring efforts, they at once opened their ranks and charged the Turk. The enemy put up a strong fight but was driven off in rout.

As was inevitable, our losses were serious. They occurred for the most part among the trees and on the open ground round the oasis. In the open there was no shelter, and among the trees there was little shelter from an encircling fire.

Such, in brief, is the story of a brilliant stand. But the story is not complete till the part played by the R.A.M.C. is told. These formed a small band. But their work was great—as great as was their opportunity.

The dressing station at Dueidar was an advanced post of the Edinburgh Field Ambulance, consisting of one officer, one corporal, and seven privates.

Their story is best told by one of the survivors of this little band—Private J. M'Aslan. It is a tale of fine heroism, simply told.

"We were wakened at 4.30 A.M. by whistles blowing and then we heard rapid rifle fire. We all went to our posts. We knew exactly where to go, as we had had a false alarm the previous week. I went to the water-tanks to stop any leakages that might be caused by bullets. Captain Roberts, the post commandant, gave instructions that the medical officer had to go up at once to the redoubt on the right, where there were casualties. Lieutenant Miller ran across, taking Colthart with him. M'Kinnon and an R.S. Fusilier stretcher-bearer went across to the redoubt in front to attend to wounded, but the officer in charge would not let them take the casualties back, as the firing was too dangerous.

"About 7.30 A.M. Captain Roberts gave instructions that a man, who was carrying a message from the redoubt on the right, and who was struck about fifty yards from the trees, should be brought in. M'Donald rushed out and bandaged him up, and Ritchie followed with a stretcher. Just before Ritchie reached him, M'Donald was struck in the face, but, merely wiping the blood away, he gave Ritchie a hand with the stretcher. Ritchie was immediately afterwards struck on the shoulder. In spite of their wounds, they carried the stretcher about twenty yards. By this time blood was gushing freely from M'Donald's wound. Wright and Wood rushed out and brought the stretcher under cover of the trees. Corporal Raffin, seeing both Ritchie and M'Donald struck, rushed out to give them a hand, and was wounded by bullets through both thighs, just when he got beyond the trees.

"I was standing near, waiting for a suitable occasion to run over with water to the men in the redoubt. I dropped the water-bottles I was carrying, and rushed across and brought Corporal Raffin in by gripping him under the arms. He crawled twenty

yards himself through the trees before I reached him. I carried him across to the opposite side of the trees, where our dressing tent stood.

"By this time the relieving company of R.S.F. had arrived. Their C.O.'s orderly rushed up shouting for R.A.M.C. men, as some officers were lying out wounded. I went along, and, with two R.S.F. men, brought in Adjutant Crawford and Captain Bruce, A.S.C., who had been both wounded to the left of the trees, about twenty yards out. Captain Bruce was wounded whilst endeavouring to bring Lieutenant Crawford under shelter. I attended to Captain Bruce, but he was hopelessly wounded, and died half an hour afterwards.

"I went back to the tent to get more dressings. M'Donald had by this time dressed the wound on his face himself, and he had dressed Raffin's wounds. I saw Wood lying dead beside him. M'Donald told me that Wood had just brought some dressings out to him, when he was shot through the throat.

"We then set-to to get the patients away from the exposed front part of the wood, where the bullets were by now falling thickly. We carried them back two hundred yards or so, and then we redressed some of the wounds.

"By this time two medical officers and some R.A.M.C. orderlies had arrived with the relieving troops. I saw Lieutenant Miller being carried in. I heard afterwards that he had said to Colthart that he would have to leave the redoubt and run across to see how some of the men were getting on. He did not know that other medical officers had arrived by this time. He had seen men dropping amongst the trees, and saw that his services were wanted there. He was strongly advised not to risk exposing himself in the open, but he persisted, and he was badly shot through both thighs and in the hand soon after leaving the redoubt.

"M'Donald and Corporal Raffin were extremely plucky throughout the action. At the end a number of men came up and shook hands with M'Donald, congratulating him on what he had done. Even though his wound on the face was severe, he stayed at duty till 8 o'clock at night, and only left when all the wounded had been dressed and sent off. For a considerable time, in the absence of Lieutenant Miller, who was at the redoubt, Corporal Raffin supervised the collection and dressing of the wounded, and he came across to see how I was getting on at the water-tanks. He was very plucky and cool throughout."

It was a plucky incident, of which the ambulance is justly

proud. For their bravery in front of the enemy Corporal Raffin and Private M'Donald were awarded the Military Medal.

This action is especially interesting in the history of our unit as it constituted the first occasion in the Sinai campaign in which a field ambulance was engaged in a battle.

IX. Battle of Romani.

4th August 1916.

As the railway advanced the troops pushed further and further forward into the desert, and by June we had an advanced station at Romani, which is about twenty miles or so from the Canal. The main station of the ambulance still remained at Kantara. To it all the casualties from the brigade, which it was our function to serve in the desert, were carried by the returning empty ration trains. In these days there were no ambulance trains. Cases which required to be evacuated from the main station at Kantara were taken to the general hospital in Port Said by means of an ambulance boat, which plied backwards and forwards along the Suez Canal.

The advanced dressing station of the ambulance in the desert in the early days was marked by a little bunch of circular tents, and its function was advertised to the world by the Red Cross and Union Jack flags flying horizontally from the cross-bar of the flag-staff. This had always been the custom, but in response to a message dropped on the 27th July from a Turkish aeroplane, stating that the station could not be picked out from the air, from this time afterwards a ground flag was used with a large red cross painted on it.

The message is in indifferent French and is reproduced here because of its interest.

"À l'Officer Commandant de Romani. Nous vous remercions pour votre avertisement sur la situation exposée de notre ambulance à El Atshan. Nous ne sommes pas en état de reconnaître vos ambulances. Nous vous prions de mettre des grands drapeaux blancs avec la croix rouge sur le sol."

It was perhaps just as well that we accepted the hint, because some days afterwards Turkish planes dropped a considerable number of bombs on Romani.

By this time the air was full of the rumour of impending battle. The Turkish army had crossed the desert for the second time and was again descending for an assault on the Suez Canal.

They would be here in a few days, so the first story had it. Then we were told that they had thought better of it and were digging in some miles in front of our defences. Were we going to attack or were we going to let the Turk batter himself against our strong positions, as he must do sooner or later? For he could not maintain himself for long in the barren desert, with his base so many miles behind that the task of feeding his army and providing water and ammunition must have been a source of constant difficulty and anxiety. His only chance lay in a decision quickly sought.

The position we held was an extremely strong one by Nature. At Romani the desert rises into dunes, some of which are several hundreds of feet high. On the north the rising ground stretches in rolling dunes of sand to the sea about three miles away, whilst on the south and west the hills extend backwards in a wide circle as far as the eye can see. Standing on the high ground, which in places drops sheer down to the surrounding desert, one looks out for miles across the flat, sandy plain over which the Turk had to advance for the assault. In the near distance the clump of palms denotes the oasis of Abu Hamrah, whilst, away beyond this, the broad plantations of Katia and Rabah can be plainly seen.

It was a position endowed by Nature for a defending army, and the months of occupation had seen it transformed into a rampart of strength bidding defiance to even a large force intent on reaching the Canal.

The troops were confident and awaited the blow with cheerful, calm spirits. It was not long before the Turk was again on the move, and before dawn on Friday, the 4th August, his guns began to play on the strong chain of posts stretching along the heights of Romani. With dawn his infantry moved forwards to the assault, harassed constantly by our mounted troops which retired as he advanced. His aim was to turn the flank of the position from the south, and here the bulk of his troops were employed.

As the tide of battle swept round us to the south that afternoon, and we could see the Turkish shrapnel bursting on the hills far behind us, it looked almost as if the Turk had succeeded in his object and that we were being caught in a trap. It looked as if our only escape would be northwards by the sea. The enemy circled so far round our position and was so far abreast of our rear that his shells were falling on the railway between us and Pelusium, the railway station immediately behind Romani, and all traffic was held up. The writer, who set out from Kantara by railway on the morning of the battle to visit the advanced dressing station

at Romani, found that, after a short distance, the journey was impossible and, in company with friends bent on reaching the same place, found it necessary to continue the journey on borrowed horses.

But we were not long in learning that the Turk had been lured to his doom and that a strong counter-attack had immediately turned the tide of battle in our favour. Next day we saw the evidence of this in the long line of prisoners that were marched down the slopes just over Romani to the railway siding to be entrained for the base. On that occasion we counted fifteen hundred of them, and they kept coming in in batches thereafter till the numbers reached the grand total of four thousand or thereby.

The field ambulance was placed on some low ground a few hundred yards behind the defences. It was in the centre of things, and it looked many times as if some calamity might overtake it, but the shells and bombs fell at some distance all round and left us free to carry on the work, which the evening brought with it in full measure. We were so sited beside the railway that practically all the wounded passed through our hands. Placed, as we were, so near the fighting, the wounded began to pour in early, and during the Friday afternoon and night and the Saturday the camp was the centre of a busy traffic as the mule-drawn sand carts and the camel convoys arrived in constant succession laden with wounded. During these two or three days quite a number of wounded Turks passed through the ambulance station, and exhausted and emaciated a large number of them were, after their heavy marching across the sand and the long privations in food and drink which they had experienced. Their sufferings from thirst, especially during the final two or three days, must have been agonising. Fortunately the camp was not far from a plentiful water supply and we were able to give them as much as their heart desired.

During the earlier stages of the battle the wounded were carried by the stretcher-bearers from the posts and from the field to the sand-carts and camels, which were pushed forward from the dressing station to as near the area of the casualties as circumstances would permit. The sand-carts, or desert ambulance carts, as they were called officially, which were constructed for two patients, were used for serious cases in which severe jolting had to be avoided, *e.g.* abdominal wounds, fracture of the thigh, etc. The camel, which carried one patient lying or sitting on

A Mule-drawn Sand-Cart.

Desert Hospital Train.

each side, was early found to be of little use for such serious cases, for the swaying gait and the jerking movements of rising up and getting down (or "barraking" as the Arabs call it) were so great that the patient's condition might suffer gravely from even a short journey.

From the point of view of field ambulance work in the desert, the experience of this battle provided many valuable lessons from which we profited in our future operations. Our own casualties were comparatively slight, but the collection of wounded from outlying parts of the field was such a slow process over the soft sand, and so quickly used up the animals, that the need for a comparatively large provision of sand-carts and camels for wounded in any desert fighting on a large scale was soon proved.

On the afternoon of the 5th August a section of the field ambulance with sand-carts and camels was hurriedly mobilised and set off with the mounted troops in pursuit of the Turk, who by this time was in full retreat. Later in the day another section of the ambulance mobilised with its brigade of infantry for the same object. These two ambulance parties did not rejoin the parent body for some days afterwards. During the pursuit the ambulance convoy with the mounted troops had some hard and exciting work to perform. But every hour of it was enjoyed as keen sport, and on their return there were many interesting stories to tell to those who had not been fortunate in being chosen for the "mobile."

In these days there were no ambulance trains to be seen in the desert like those that nowadays carry a wounded man to the base in smooth comfort. There were only improvised trains with luggage waggons transformed to carry stretchers. These were for severe cases. Ordinary ration trucks returning to Kantara empty were used for the transport of the more slightly wounded men. The journey was only a matter of twenty miles, though in an open truck, with nothing to shelter you from the blazing desert sun, even such a short journey might be trying to a degree.

Within a short time a fully equipped hospital train was placed on the line, and its first appearance at Romani, as its long length drew alongside the revetted banks of sand that formed the station platform, was a sight we shall long remember. The procession of white carriages with the painted red cross moving over the desert formed a pleasing picture, and for us it stood as an emblem of luxury and comfort among the drab surroundings of the desert.

The impelling needs of water in the desert have been referred

to. Water is the fact that dominates every other consideration, and with an army such as ours it was a problem that required heroic handling. The amount of water that the desert itself could be trusted to provide, both from established wells and from wells sunk by the engineers in the country as we moved forwards, was too limited for a big army. For this reason, we brought a great part of our water with us from Egypt by iron pipes, that were laid across the sand from Kantara and which were extended forwards as we advanced. A thought of what this means in labour, material and expense will show the bigness of the problem.

This water was drawn from one of the many canals that carry the water of the Nile to the sea. It flowed through Kantara, where it was taken off, purified first by filtration and then by chemical means, and thereafter pumped across the desert to reservoirs placed at convenient places for the troops.

The Sinai campaign saw two great romances in engineering. The one was the railway line that bridged the arid desert (that greatest barrier of all between countries) and brought two continents for the first time into close and lasting union. Its results are still obscured by the clouds of war, but it opened an era of illimitable promise. The other was the iron pipe that accompanied an army far into the waterless desert and that led to the thirsting troops the waters of the Nile.

X. The Camel.

The battle of Romani was the first great success in the field which our division had shared in. A Turkish army of no insignificant size was marching confidently to strike a blow at the Canal, in the hope of causing us serious commercial damage and difficulty and of impairing our prestige among the Mahommedan world of Egypt, India, and the East. It had been routed within a few hours of the first shock of battle, and it left large numbers of prisoners in our hands and large numbers of dead on the field.

The spirits of the men ran high. The magic power of success in battle was seen wherever you went amongst the ranks. And the intense work and training which were commenced to equip the army for mobile operations on the desert were taken in hand with alacrity and enthusiasm.

The question uppermost in all minds was, Were we going to settle down to defend the integrity of Egypt and the Canal, or were we going to push out across the desert to wrest Sinai back

could—at all times for the man badly hit, and as often as possible for the slightly wounded.

By this time the initial feelings of antipathy with which we received the camel's entrance into our scheme of things had largely passed off. For he had demonstrated the qualities which henceforth made him indispensable to our life and work. At the beginning we had only remarked his vices, for his bad traits are all on the surface. His whole attitude bespeaks boredom and stolid indifference, and when he stands up and slowly moves his head from side to side, with a motion ever the most deliberate, he seems the incarnation of offensive vanity. I once heard him described as the "supercilious teapot." And the simile is as apt as it is humorous.

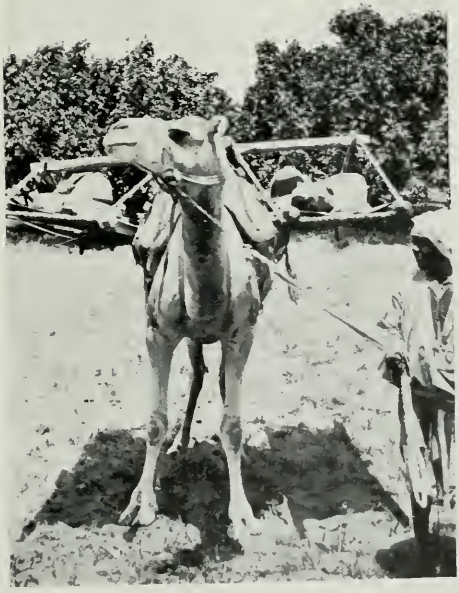
But we were not long in recognising the solid worth disguised beneath this unengaging exterior, for slung on his pack-saddle he would carry for you during hours and days across the soft sands a full weight of 400 lbs. of baggage. And he would utter never a word of complaint, except perhaps to gurgle or grunt a bit when the native driver went to fit on the load. But, strange to say, he was just as likely to express himself in similar terms when the driver, at the end of a hot day's march, started to release his burden.

There was another feature about the camel which early endeared him to our hearts. He cared not a rap for all the shells that ever were. Our long convoy once came under heavy shell-fire north of Gaza, and a number of the camels and mules were struck. The mules kicked and shied and threatened to stampede; but the camel column moved quietly on with apparent unconcern. I have seen a large herd of grazing camels caught in a sudden storm of shell. Numbers were hit, but their fellows continued to feed as if nothing were amiss.

And then, of course, there was his most remarkable trait of all, the trait that above all others adapts him to a desert life—his moderation in drink. He is popularly supposed to go for many days without water and suffer no harm. But this is not so. We found in practice that to keep him fit and well he had to be taken to water every second day, and it was only where water was gravely short, as not infrequently happened, however, that we allowed four or five days to elapse.

With all his good qualities, which raise him to the rank of the noblest beast of burden, in the interests of truth let it be at once confessed that he could at times be a cause of distress and

An Improvised Cacolet for Sitting Patients.



An Improvised Cacolet for Patients Lying Down.

even dismay in the camp. Without the least provocation he would sometimes suddenly seize in a vicious grasp the person nearest to his reach, and in most cases this was his own unoffending Egyptian driver. His jaws are powerful and in his bite he would crush a limb like matchwood. At other times, when excited from any cause, he would suddenly go mad, or "macnoon" as the natives call it, and break loose, to cause consternation in the camp, until he was brought to bay by the drivers with a long circle of strong rope which they closed gradually round him.

There were only two occasions when his attitude of passive listlessness was roused into life. This outburst of insane ferocity was one. The other was when the feeding time arrived and the native drivers were paraded at the end of the camel lines to draw their forage ration. The long rows of sleepy animals were then as if galvanised into new life. They would all rise from the ground in a body, and, swaying and dancing from side to side in the most laughable manner possible, they would tug at their head-ropes in a perfect frenzy of excitement.

Despite his faults, he is a creature to excite wonder and admiration, and when the full story of the campaign is written a large page will be occupied by the work of the Camel Transport Corps, or C.T.C. as it was called for short.

(*To be continued.*)

CLINICAL RECORD.

HERPES ZOSTER AND VARICELLA.

By A. DINGWALL FORDYCE, M.D., F.R.C.P.(Edin.).

THE following domestic tale appears to be of sufficient interest to be put on record.

On Friday, 11th April, our two boys, aged respectively 16 and 13, arrived in Edinburgh from school for the Easter holidays. They were both apparently in good health. The elder boy, however, seemed rather depressed and within a day or two began to complain of pain in the right side of his head for which no cause was discoverable.

On Friday, 18th April, a vesicle appeared on the right cheek immediately in front of the ear. It quickly became obvious that the condition was herpetic, and in the course of the following few days it spread and extended up the head and down to the chin. Ultimately there was well-marked herpes affecting the right anterior parietal region, the right ear and external auditory canal, the right cheek and chin, and the right anterior part of the tongue both superiorly and inferiorly. There was considerable pain, general malaise, marked salivation and fever.

Drs. Norman Walker and John Thomson both saw the case and agreed with me that the condition was one of herpes zoster. Dr. Douglas Guthrie examined the ear and reported a healthy membrana tympani, but several herpetic vesicles in the external meatus.

By Thursday, 1st May, the skin condition was largely healed, but as the boy was thin and run down he was preparing to start for the country on the following day. The same evening, however, the younger boy complained of feeling sick, refused food, and was found to have a temperature of 99·8.

On the next morning—Friday, 2nd May—twenty-two days after leaving school and fourteen days after the herpetic eruption first appeared in the elder boy—a few spots were found on the younger boy (head, face, chest), which in the course of the day developed into vesicles and proved the commencement of a typical case of varicella. This diagnosis was also verified by Drs. Norman Walker and John Thomson.

Three days later, *i.e.* on Monday, 5th May (seventeen days after the first herpetic appearance on boy 1), the characteristic rash of varicella began to appear on the baby girl aged 1 year 11 months.

This case ran a natural course and the diagnosis was verified by Dr. John Thomson.

So far as can be ascertained there had been no case of varicella at the school from which the boys came for certainly some considerable time. It is possible that the younger boy contracted the infection at school, but this could not have been the case with the baby, nor could she have been infected only from the younger boy.

Both brother and sister saw much of the elder boy during the whole time he suffered from herpes — the one contracted varicella fourteen days and the other seventeen days after the first herpetic manifestation.

So far as is known none of the three were otherwise in contact with varicella, and as regards the baby this is almost certain.

P.S.—The elder boy has shown no sign of varicella (28th June).

CRITICAL REVIEW.

ENDOSCOPY.

By J. K. MILNE DICKIE, M.D., F.R.C.S.E.

During the last few years there have been many improvements in endoscopic methods, and the literature of direct laryngoscopy, bronchoscopy, and œsophagoscopy has become enriched by many valuable contributions. Many pathological conditions of the air- and food-passages can now be diagnosed with certainty, the existence of which could only be surmised some years ago. Since the widespread use of endoscopic methods each year adds improvements in technique, and we have now at our disposal safe and reliable means of diagnosis and treatment in regions hitherto inaccessible.

Kirstein in 1895 saw the interior of the larynx for the first time by the direct method. He used a long, slightly curved spatula with a handle at right angles. Later Killian and others took up the idea and introduced the tubular speculum. Many modifications of this have since been made, and from direct laryngoscopy the method was extended to bronchoscopy and œsophagoscopy.

There are many forms of laryngeal speculum for use with the direct method at the present day. One of the most convenient is that of Chevalier Jackson,[1] which has the advantage that his bronchoscope can be passed down through it. This advantage is also found with William Hill's laryngeal speculum, which is conical in shape, with a wide upper end, and has a slot running down the side for the introduction of a bronchoscope or other instruments. Mosher's instrument[2] is open above and gives a very large field of view. In 1911 Killian[3] described his method of suspension laryngoscopy and pharyngoscopy. The principle of this method is that, with the patient in the recumbent position, the tongue and the whole interior wall of the pharynx are supported on a spatula of special design, which hangs from an overhead framework or gallows. The weight of the head and neck pulling on this opens up the whole pharynx down to the mouth of the œsophagus. This method must be regarded as a very great advance in technique since it has the following advantages: (1) It permits of binocular vision. (2) Both of the surgeon's hands are free, and as a consequence much more delicate manipulations may be carried out. Since the original introduction of suspension the apparatus has been considerably improved by various laryngologists, notably Albrecht, and later Lynch.[4] Lynch's most valuable modification is in the gag apparatus. The upper jaw is fixed in the apparatus by means of an impression

tray containing impression composition. The arrangement of the parts also is such that there is nothing to obstruct the view or the introduction of instruments.

With regard to illumination, it may be mentioned that there is some difference of opinion as to the best method. Some operators, and in fact the majority on this side of the Atlantic, favour the method by which the parallel rays of a strong beam of light are directed down the tube, either from a mechanism attached to the handle, such as the electroscopes of Brünings[5] and Kahler, or from a headlight such as Kirstein's. In America, however, endoscopic tubes with distal illumination of the type of those used by Jackson[1] and Mosher[2] are more generally favoured. Each method has its proper advantages and disadvantages. With proximal illumination the rays light up the trachea and œsophagus for a considerable distance beyond the end of the instrument. With distal illumination, on the other hand, the only parts lit up are those fairly near the end of the tube, while the light becomes very feeble some distance lower down. With proximal illumination also there is no risk of the light being dimmed by secretions, which is liable to occur with distal illumination. The Brünings electroscope has the disadvantage that for operative work the apparatus interferes somewhat with the introduction of instruments down the tube. This does not apply, however, to the Kirstein headlamp. For suspension laryngoscopy a headlamp or even a forehead mirror and reflected light is very satisfactory.

Position of Patient in Endoscopy. — In the case of adults most laryngologists recommend the sitting position. Brünings has designed a very useful low chair for the purpose of keeping the patient immobile in a suitable attitude. Mouret[6] recommends that the patient should sit astride a chair, facing the back. In the case of patients under a general anæsthetic the recumbent position is of course necessary, though Pauncz[7] uses the sitting position in children, even with general anæsthesia. Johnston[8] prefers to have the patient flat on his back, with the head held in the middle line and slightly raised from the table by an assistant. Killian, Jackson, and Mosher also do endoscopy with the patient on his left side. Jackson insists that extraction of foreign bodies should only be attempted with the patent recumbent or even in the Trendelenburg position.

Anæsthesia.—There is a growing tendency in America to discard the use of general and local anæsthesia in children. This is in a great part due to the example of Jackson and Johnston. For many years these authorities have used no cocain nor general anæsthetic in children under six, except in the case of foreign bodies with sharp angles, where the effect of coughing or vomiting during removal might be dangerous. Anæsthesia is absolutely contra-indicated, according to Jackson,[9] if there is the slightest dyspnœa. He also states that for œsophagoscopy

in adults, as the œsophagus is insensitive, no anæsthetic is necessary except in the case of sharp foreign bodies. Local anæsthesia, if used at all, is limited to regions above the cricoid. General anæsthesia increases enormously the risk of respiratory failure during the removal of a foreign body. For the removal of growths from the larynx cocain is necessary, though not for simple examination. In diagnostic bronchoscopy cocainisation of the epiglottis and larynx is necessary.

In this country most operators use general anæsthesia in children. For adults cocain is generally used to abolish or diminish reflexes. Occasionally general anæsthesia is used, and in the case of bronchoscopies chloroform is generally preferred as ether tends to increase secretion. A preliminary dose of atropin is advisable in any case.

Direct Laryngoscopy.—The direct method is the only possible means of examining the larynx in very young children. In these adults with a backward projecting epiglottis the interior of the larynx cannot be seen with the mirror, and the direct method is here an advantage. For intralaryngeal operations it has largely superseded the older indirect method. Much more accurate work can be performed under guidance of direct vision than by the use of the mirror. Jackson recommends it for treatment of papillomata, removal of pieces of tissue for microscopic examination, treatment of tuberculosis by cautery, etc. Johnston [10] holds that wherever a growth is situated in the larynx it is more easily removed this way.

Pauncz has examined cases of congenital laryngeal stridor and observed that during an attack the two halves of the epiglottis are drawn together and the mucosa of the arytenoid region is also sucked into the larynx. The same observer has utilised direct laryngoscopy for the removal of membranes and secretions in acute infections.

Suspension laryngoscopy is recommended by Albrecht [11] as the method of choice for the treatment of laryngeal papillomata. Lynch [4] writes to the same effect and recommends it in addition for the treatment of vocal nodules, where a degree of precision is desirable which is unattainable by any other means.

Bronchoscopy.—Jackson [9] lays down the following indications for bronchoscopy :—

(1) Where there is a suspicion of a foreign body. Even after spontaneous expulsion of a foreign body there may be another piece remaining.
(2) Where a radiogram shows a foreign body or suspicious shadow.
(3) Where there is tracheal or bronchial stenosis.
(4) Where there are physical signs of phthisis without tubercle bacilli in the sputum, especially when the signs are localised to the base of the lung, even if there is no history of foreign body.

(5) All cases of bronchiectasis.
(6) When there is dyspnœa not due to obvious cardiac or pulmonary disease.
(7) When there is dyspnœa not relieved by tracheotomy.
(8) Cases of hæmoptysis which are not definitely tubercular.
(9) Cases of recurrent laryngeal paralysis of unknown origin.
(10) In thoracic disease of doubtful character.

In more recent years bronchial asthma has been treated, by Ephraim,[12] Freudenthal,[13] and others, by the spraying of adrenalin on to the bronchial mucous membrane through the bronchoscope.

Technique.—Jackson[1] makes use of his laryngeal speculum for the introduction of his bronchoscope, which is of relatively fine calibre. It is distally lighted and has a fine tube let into the side for the aspiration of mucus, etc. Brünings' instrument is extensible and is made in several sizes, from 4 mm. diameter to 13 mm. The outer tube has a beak-shaped end for introduction through the glottis. The inner extension tube has a circular end. It is lighted from the handle. It has an advantage over Jackson's instrument in that the field of vision is much larger and that objects are much nearer the eye unless the tube is extended to its fullest extent. Hill uses his slotted laryngeal speculum for the introduction of the bronchoscopic tube. Yankauer[14] has devised an attachment to protect the operator's eye from chloroform vapour, expectoration of secretions, etc. It blows a small jet of air at right angles to the top of the tube at about two atmospheres' pressure. He uses the same principle for blowing away secretions from the lower end of the tube.

Subglottic œdema is very liable to occur in children after bronchoscopy, and may lead to complete occlusion of the air-passage, necessitating intubation or tracheotomy. This complication is attributed to trauma of the tissues and the use of too large a tube. To avoid it, Killian and Jackson recommend the use of very small tubes (4 mm.). In Jackson's clinic[9] there had not been a single case out of thirty children under one year examined since 1911. Sehrt[15] advises preliminary tracheotomy and lower bronchoscopy for all cases in which there is the slightest trace of lymphatism. Mosher[2] advises that a straight intubation tube should be carried with all bronchoscopic equipment for use in case of sudden respiratory embarrassment.

Since the introduction of bronchoscopy many conditions can be diagnosed with certainty *intra vitam* in a way formerly impossible. Numerous cases of tumour of the trachea, bronchi, or lungs seen by bronchoscopy have been described by Lejeune,[16] Ephraim,[17] Chiari,[18] Hald,[19] and others. Ephraim[20] had three cases of non-tubercular hæmoptysis. Two of these were from cancer of the lung, and one from angioma of the trachea. The latter condition was cured by loca. treatment. Jackson,[9] in cases of hæmoptysis, had found the cause to

be aneurysm three times, cancer twice, and syphilis twice. Kahler[21] has drawn attention to the condition where stenosis of the left bronchus is caused by enlargement of the left auricle in cardiac disease. The displacement may be so great as to kink the bronchus. Eleven cases are described. Cases of stenosis of the bronchi from pressure of mediastinal glands and tumours are not uncommon. Ephraim[20, 17] had one case of dyspnœa from pressure of glands, one from kinking of the left bronchus by a tumour, and one from aneurysm.

Ellen Patterson[22] relieved dyspnœa in a child by removing thick, tenacious mucus. She also reports a case of occlusion of a bronchus by diffuse inflammatory swelling. Macnab[23] has removed streptococcal membranes from the trachea. Brown Kelly[24] had a case of stenosis of the trachea and œsophagus from abscess between these structures. Killian[25] reports a case where a calcified bronchial gland had burst into the bronchus and been expectorated. The place where this had come from was seen with the bronchoscope. A similar case has been reported by Mann.[26]

Foreign Bodies in the Trachea and Bronchi.—Chevalier Jackson has probably had more experience with this class of case than any other laryngologist. In a recent paper[27] he has given his observations based on an analysis of 628 personal cases. Of these 98·1 per cent. were successful. The mortality directly attributable to endoscopy was less than ½ per cent. Taking all deaths from any cause whatsoever one month after endoscopy his mortality was 1·9 per cent. In connection with this it must be remembered that in a certain proportion of his cases unsuccessful attempts had been already made by other operators to extract the foreign body.

As regards the type of foreign body in the lung there are considerable differences in the amount of reaction produced. Metallic foreign-bodies, glass, pebbles, vulcanite, etc., cause comparatively little reaction, while vegetable substances such as beans, peas, grains of corn, peanuts, etc., cause a marked irritative reaction. Roasted peanut kernels are by far the worst in this respect, causing a diffuse tracheo-bronchitis in a few hours, which is generally rapidly fatal if left to nature. The amount of reaction caused by hard foreign bodies seems to depend on whether they cork the bronchus or not. If they are rough or pointed a certain amount of local trauma is caused, but the local reaction does not as a rule spread. Meat and bone cause comparatively little reaction.

The right bronchus is more commonly the seat of foreign bodies than the left. They are rarely situated in the bronchus to the middle lobe. The usual situation is immediately below the branching of a bronchus, and more often in a posterior than an anterior branch.

Foreign bodies in the trachea are more uncommon and are usually

extracted early. Rozier[28] reports a case of unsuspected presence of a denture in the trachea for four months.

Foreign bodies in the bronchi tend to gravitate continually downwards and towards the periphery of the lung. If they occlude the bronchus the air beyond becomes absorbed and there is an accumulation of secretion. The part of the lung concerned collapses and bronchiectasis or abscess formation results. Jackson states also that an inflammatory stricture forms above an impacted foreign body, and that in case of abscess or bronchiectasis the foreign body is always near the upper limit of the pathological mass and in the region of the neck of the cavity. Foreign bodies all tend to a fatal termination in time from septic lung complications. The longest case on record is one where a glass collar-stud had been in the lung for twenty-six years, Jackson.[29] The long duration of this case is attributed to the fact that the foreign body was smooth and did not occlude any of the passages. The patient had emaciated to 98 lbs. Two years after extraction of the foreign body she was in perfect health and weighed 128 lbs. Guisez[30] has removed a paper-knife from the bronchus 7 cm. in length. He has also had four cases of adenoids in the bronchus.[31]

In making the diagnosis of foreign body in the lung careful attention must be paid to the history of the case. A good radiographic picture is of the greatest value, since even if the foreign body itself be not opaque, the resulting pathological changes in the lung usually show up and give a guide as to its situation. Incidentally it may be noted that instantaneous-flash radiograms give much better results for this class of work. A careful physical examination of the chest also gives us information as to which part of the lung is affected. Jackson[32] has described a sign which is often present. It is an "asthmatoid wheeze," which is heard by placing the ear opposite the patient's open mouth. Unlike the wheeze of bronchitis, it is heard better after expectoration of secretion. If not present with ordinary respiration, expiration of the residual air may elicit it. In the absence of other signs, when the bronchoscope is introduced into the trachea, the affected bronchus is usually seen to contain secretion and to show some signs of local inflammation, which is enough to indicate in which direction the foreign body lies. In the diagnosis and treatment of foreign bodies the importance of good team work cannot be overestimated, as reliable reports from a good physician and a good radiologist are of great help.

In the removal of small foreign bodies from the smaller bronchi near the periphery of the lung, where the bronchoscope cannot penetrate, fluoroscopic bronchoscopy may be tried. Foreign bodies have been successfully removed in this way by Ingals[33] and Lynch.[34] Per-oral removal is to be preferred, but if the operator is not very expert and the case a difficult one, preliminary tracheotomy followed

by lower bronchoscopy may be advisable. In all manipulations gentleness is of prime importance (Jackson).

Special instruments have been invented for the removal of certain foreign bodies. Mosher has devised a very useful safety-pin remover, and pin cutters and forceps for breaking up dental plates can also be obtained.

Œsophagoscopy.—Indications :—

(1) Difficulty in swallowing.

(2) Regurgitation of food.

(3) History of foreign body.

(4) Cases of globus hystericus and other "functional" disturbances.

The only contra-indications that Jackson [9] recognises are cases with water-hunger. Gastrostomy should be done first in these cases.

Most of the instruments used in bronchoscopy can be used in œsophagoscopy. Mosher [2] uses an œsophagoscope oval in section. He claims that with this type of tube a much larger size can be introduced than if circular in section. He uses instruments of two lengths —11 in. and 17 in. They are lighted distally and have an appliance by which air can be pumped into the œsophagus to balloon it out. Hill's instrument is conical, with a lateral slot running down its whole length. He also has a dilating œsophagoscope formed of two blades which open at the distal end. Brünings' extensible instrument is very generally used.

The causes of stricture of the œsophagus are cicatricial contraction, chronic œsophagitis, spasm, malignant disease, and pressure from neighbouring structures.

Attention has been drawn to simple inflammatory strictures of the œsophagus mainly by the writings of Guisez.[35] He distinguishes two forms—the old cicatricial form and the hypertrophic form. The latter is a chronic œsophagitis due to alcohol, insufficient chewing of food, etc., and has a tendency to cause dilatation or diverticulum above. These inflammatory strictures are commonest in the post-cricoid and cardiac regions. He treats them by radium or electrolysis.

Spasmodic stricture at the cardiac end of the œsophagus is not uncommon. It is usually accompanied by dilatation of the œsophagus above. According to Brown Kelly,[36] in most cases of idiopathic dilatation of the œsophagus there is spasm of the cardia. This spasm yields to stretching. The closure of the œsophagus is not as a rule tight, but will relax after a little steady pressure. Several distinct conditions appear to be included under the term cardiospasm. In some cases the dilatation of the œsophagus appears to be primary in neurasthenic individuals ; in others the spasm at the lower end seems to be the causal factor, and is a result of hyperacidity in the stomach or faulty action of the vagus fibres which normally cause the cardia to open. For further information on this subject the reader is referred

to Mosher,[2] Brown Kelly, Hill, Irwin Moore, and others.[37] In connection with functional inability to swallow and dilatation of the œsophagus (achalasia), Mollison [38] has shown that the condition may be followed some months later by malignant disease. In such a case of cause one must suspect that the malignant disease was present before the onset of symptoms. Logan Turner [39] is of opinion that a diagnosis of functional difficulty in swallowing, especially in women, should be avoided, as those symptoms may exist for many years before definite signs of malignancy develop.

Cancer of the Œsophagus.—In Logan Turner's experience females are much more commonly affected than males. The proportion is roughly two to one. Out of 68 undoubted cancer cases the growth was situated at the upper end of the œsophagus in 62 cases, and at the lower end in 6. Of those at the upper end, 26 cases, or 38 per cent., involved the hypopharynx, while 36 cases, or 52 per cent., involved the œsophagus only. "The disease may be limited to the upper end of the œsophagus, while in no single instance was it found involving the hypopharynx alone." The use of bougies in the diagnosis of cancer of the œsophagus is unjustifiable. The only information to be obtained by such means is regarding the situation of the stricture. This can be obtained with much greater accuracy and no danger by a bismuth meal and skiagraphy. The danger of perforating the œsophagus with a bougie is considerable, and a fatal peri-œsophageal phlegmon results. A case of this sort was reported by Loubet Barbon.[40] The passage of the œsophagoscope under the guidance of the eye is preferable, though it is not advisable to pass it beyond the stricture if it is narrow, as a false passage may be caused. Amersbach [41] reports a case where perforation occurred during examination. Cancer may show itself in many forms. There may be a warty growth projecting into the lumen, there may be a flattened hard part of the wall with or without ulceration, there may be an annular stricture, or merely a bulging under intact mucous membrane. In doubtful cases, removal of a piece of tissue for examination may clinch the diagnosis, though it must be remembered that a negative report is of no great value. Guisez [42] recommends application of radium in inoperable cases, from which he has obtained some benefit.

Cases of coincident cancer and tuberculosis of the œsophagus have been reported by Cone [43] and also by Zenker.[44] The association of carcinoma, syphilis, and tuberculosis have been described by Dean and Gregg,[45] who also give a review of the literature of the subject.

Other pathological conditions seen in the œsophagus are peptic ulcer (Barclay [46]), angioneurotic œdema (Arrowsmith [47]), and congenital stenosis (Guisez [48]). The latter condition is more common in males, and at the lower end of the œsophagus. A fold with sharp edges is seen. The treatment consists in curing the œsophagitis first, then dividing

the fold and applying electrolysis. Frank [49] collected seventeen cases of myoma of the œsophagus.

Foreign Bodies in the Œsophagus.—The literature of foreign bodies in the œsophagus is now very extensive, but it will suffice to quote merely the more interesting cases and state the general conclusions that may be drawn. Foreign bodies do not, as a rule, remain for a long period in the œsophagus, though Porter [50] has reported the case of a coin in the gullet for eight years. Kyle [51] also describes the removal of a denture in the œsophagus after eighteen years. The denture was found to be embedded in granulations. Foreign bodies with sharp points or hooks, such as brooches, safety-pins, or dentures, are particularly dangerous, as there is a considerable risk of perforation and subsequent septic complications. This is apt to occur if the foreign body is left alone, but is still more likely if blind attempts at removal or pushing on into the stomach with probangs, coin-catchers, or bougies are made. Blind instrumentation cannot be too strongly condemned, as it is likely to lead to disaster. Among the complications of foreign bodies in the œsophagus, the following are worthy of note. Goffe [52] reports a case where the point of an open safety-pin had penetrated the arch of the aorta. Chiari [53] had two cases of perforation of the aorta from septic processes following perforation of the œsophagus. Karewski,[54] De Stella,[55] Jurasz,[56] and others have described peri-œsophogeal phlegmon occurring from perforation of the œsophagus by foreign bodies. The latter collected fifteen cases. Recurrent laryngeal paralyses as a result of foreign bodies in the œsophagus have been described by Kubo [57] and Konigstein.[58] The latter's case had also a fistula into the trachea.

In the diagnosis of foreign body in the œsophagus, radiography may give us very valuable information not only of its presence, but of its exact shape and situation. Naturally, large numbers of foreign bodies do not show up on the X-ray plate, and, in this connection it is interesting to note that Guisez [59] out of 200 cases found that only 45 per cent showed up on the plate. In forty cases, pieces of bone were present in spite of negative X-ray reports. It is important to do œsophagoscopy as soon after radiography as possible, as the foreign bodies are apt to change their position.

The extraction of foreign bodies may be exceedingly difficult, and great care is needed to avoid accidental perforation. Jackson [9] states that with general anæsthesia and complete relaxation any foreign body may be extracted. Paterson [60] has had difficulty in discovering certain foreign bodies which were pink in colour and almost indistinguishable from the œsophageal wall. Mackenzie [61] reports a death from perforation of the pleura in extraction of a safety-pin.

In reviewing the subject of endoscopy, and particularly with reference to foreign body work, the conclusion is reached that in this, as in other branches of medicine and surgery, further specialisation is

desirable. In centres like Edinburgh the amount of clinical material is not sufficient to allow of a laryngologist confining himself to this class of work, but where this has been possible, as in the case of Chevalier Jackson, the gain to medical science has been very great.

REFERENCES.—[1] Chevalier Jackson, *Per-oral Endoscopy and Laryngeal Surgery*, St Louis, 1915. [2] Mosher, Contrib. to *Operative Surgery of Nose, Throat, and Ear*, edited by Loeb, London, 1914. [3] Killian, *Trans. Internat. Laryngological Congress, Berlin*, 1911. [4] Lynch, *Largngoscope*, July 1917; also *Clinical Congr. of Surg., Philadelphia*, October 1917. [5] Brünings, *Direct Laryngoscopy, etc.*, trans. by Howarth, London, 1912. [6] Mouret, *Rev. de Laryngol.*, No. 43, 1913. [7] Pannez and Winternitz, *Orvosi Hetilap*, No. 23, 1910. [8] Johnston, *Laryngoscope*, December 1910. [9] Jackson, *Internat. Laryng. Congr., London*, 1913. [10] Johnston, *Laryngoscope*, October 1912. [11] Albrecht, *Verh. Ver. deut. Laryngol, Stuttgart*, May 1913. [12] Ephraim, *Deut. med. Wochenschr.*, No. 31, 1912. [13] Freudenthal, *Journ. Amer. med. Assoc.*, 21st January 1912. [14] Yankauer, *Fränkel's Arch.*, Bd. xxvi. [15] Sehrt, *Münchener med. Wochenschr.*, No. 27, 1915. [16] Lejeune, *Le Scalpel*, 1913. [17] Ephraim, *Verh. Ver. deut. Laryngol.*, May 1912. [18] Chiari, *Internat. Laryng. Congr.*, 1913. [19] Hald, *Trans. Danish Otol. Soc.*, February 1911. [20] Ephraim, *Med. Klinik*, No. 18, 1911. [21] Kahler, *Monatsschr. f. Ohrenheilk.*, Bd. xlvi. 1912. [22] Ellen Patterson, *Penn. Med. Journ.*, April 1918. [23] Macnab, *Journ. of Laryngol.*, September 1915. [24] Brown Kelly, *Proc. Scot. Otol. Soc.*, May 1913. [25] Killian, *Internat. Centralbl. f. Laryngol.*, No. 9, 1913. [26] Mann, *Verh. Ver. deut. Laryngol.*, May 1912. [27] Jackson, *Surg. Gyn. and Obst.*, March 1919. [28] Rozier, *Rev. de Laryngol.*, 30th April 1919. [29] Jackson, *Ann. of Otol.*, June 1913. [30] Guisez, *Ann. des Mal. de l'Oreille*, t. xxxvii., No. 4. [31] Guisez, *Trans. French Congr. for Otol.*, Paris, May 1912. [32] Jackson, *Amer. Journ. Med. Sciences*, November 1918. [33] Ingals and Friedberg, *Journ. Amer. Med. Assoc.*, 21st February 1914. [34] Lynch, *New Orleans Med. and Surg. Journ.*, December 1913. [35] Guisez, *Bull. d'Oto-Rhino-Laryngol.*, t. xv., 1912, and t. xvi., 1913. [36] Brown Kelly, *Brit. Med. Journ.*, 19th October 1912. [37] *Proc. Roy. Soc. Med.*, March 1919. [38] Mollison, *Proc. Roy. Soc. Med.*, April 1916. [39] Logan Turner, *Journ. of Laryngol.*, June 1913. [40] Loubet-Barbon, *Fr. Soc. Laryng.*, May 1913. [41] Amersbach, *Arch. f. Laryngol.*, xxviii., No. 3. [42] Guisez, *Soc. des Chir. de Paris*, 26th April 1912. [43] Cone, *Johns Hopkins Hosp. Bull.*, 1897. [44] Zenker, *Deut. Arch. f. klin. Med.*, xlvii., 1891. [45] Dean and Gregg, *Trans. Amer. Laryng. Soc.*, 1917. [46] Barclay, *Proc. Roy. Soc. Med.*, May 1915. [47] Arrowsmith, *Laryngoscope*, 1915. [48] Guisez, *Presse Méd.*, No. 27, 1913. [49] Frank, *Dissert. München*, 1911. [50] Porter, *Proc. Scot. Otol. Soc.*, November 1913. [51] Kyle, *Laryngoscope*, March 1914. [52] Goffe, *Brit. Journ. Children's Dis.*, February 1915. [53] Chiari, *Berl. klin. Wochenschr.*, No. 1, 1914. [54] Karewski, *Berl. klin. Wochenschr.*, No. 22, 1912. [55] De Stella, *Presse Otol. Belge*, No. 4, 1912. [56] Jurasz, *Med. Klinik*, No. 31, 1912. [57] Kubo, *Proc. of Kiushu-Igakukwai*, 1912. [58] Königstein, *Monatsschr. f. Ohrenheilk.*, Bd. xlvii., 1913. [59] Guisez, *Presse Méd.*, No. 101, 1913. [60] Paterson, *Proc. Roy. Soc. Med.*, December 1913. [61] Mackenzie, *Interstate Med. Journ.*, No. 10, 1914.

REPORTS OF SOCIETIES.

EDINBURGH MEDICO-CHIRURGICAL SOCIETY.

A MEETING was held on 14th May 1919, the President, Dr. John Playfair, in the chair.

DISCUSSION ON THE INFLUENZA EPIDEMIC.

(*Continued from p. 407, Vol. XXII.*)

DR. ALEXANDER JAMES said: All here will, I think, agree with me when I say that the influenza epidemics of the autumn of last year and the spring of this year were the most brain-racking as regards causation, and the most heart-breaking as regards course and treatment, of any medical experience we have ever had in our lives. One's time to-night is limited, so that I propose to confine myself mainly to causation.

Of course brain-rack in this connection might be more or less avoided if we adopted the view that a specially created virulent and infectious germ had been suddenly launched into the world and had spread all over it. But to the thoughtful physician this is a view which does not commend itself.

Arguing from analogy of better-known diseases and better-known germs, it would seem to the physician that the germ of influenza has not been a specially created one, but is simply a virulent transformation of some germ, or group of germs, already existent in the human body. Moreover, although we recognise that the influenzal pneumonias which we saw last autumn and spring were different from the classical pneumonias with which we are all familiar, yet many of us, I am sure, can call to mind, as occurring now and again in years past, lung affections which, as regards course and evidence of want of reaction power, resembled these influenzal pneumonias so closely that we can believe that the influenzas of last autumn and spring were not a new disease, but rather an extremely virulent epidemic form of a disease which we had more or less frequently seen before in a relatively mild sporadic type.

This being so, it seems to me that in our study of the etiology of influenza, information of some value might be gained by investigating the general health and social conditions under which the people of this country have been living during the last few years, and up to the time of the influenza outbreaks. We have all felt the strain and witnessed the turmoil of this catastrophic war, and if a study of the social conditions of the people reveals that since the war began any social changes have been occurring which might adversely affect the general standard of health, some evidence might be obtained to show that of the two main factors of an epidemic, viz. extra susceptibility of the individual and heightened virulence of the organism, the first, at least, has been brought into existence.

But now if anything has been occurring to lower the standard of health among the adult population of our country during the last four years, what one would naturally expect would be that during this time the general mortality of the population would be showing some increase. Investigation, however, shows that the exact contrary of this is the case. The Registrar-

General's statistics show that since 1914 the number of deaths in proportion to population has been steadily decreasing, and that indeed for the first three-quarters of 1918 the mortality-rate was phenomenally low.

And now comes an important question, Are we to believe that this lowering of the general mortality-rate has meant a real improvement in the standard of communal health and fitness, and a real increase in the disease-resisting power?

Of course there are some who adopt this interpretation without question but as doctors and as students of sociology we have to remember that in a complex organisation like the community a fall even for years in the general mortality-rate may have to be explained in a manner much less favourable from the communal point of view.

To illustrate this, let us follow our sociological inquiry a little farther. A study of the statistics of pauperism shows that in Edinburgh a progressive diminution in the number of persons claiming outdoor and indoor relief has been going on during the years of the war. Furthermore, as our legal friends have pointed out to some of us, it is the case that since the war began the number of claims for compensation, under the Workmen's Compensation Act, has been diminishing most markedly.

Does all this mean that when hundreds of thousands of our male humanity have been put out of civil work for the last four years, at the healthiest and fittest periods of their lives, yet there has been left behind a lot of men who, as regards working power and resistance to strain, have proved themselves superior? If this is not the case, what, then, is the explanation?

Every man, like his own heart or his lungs, has a working power and a reserve power. In ordinary civil life, when it is brought home to him that his working power has reached its limit, and that his reserve power is being trenched upon, we, as human beings, can easily understand that the idea which may occur to a certain number of individuals will be whether or not, instead of trenching further on their reserve power, they should seek the *otium cum dignitate* which the Poor Relief Act or Compensation Act can give him.

Being human, we can readily understand that the latter may be preferable

But during the war, when work could easily be obtained and when the remuneration for it had gone up enormously, it can be quite as easily understood that the incitement to trench on the reserve power must often have proved overwhelming.

In this way the lessening of poor relief and the diminishing in the number of compensation claims may indicate not a higher standard of health and fitness, but simply a using up of working power, and a trenching on reserve power greater than had been exercised before.

And now let us leave these pauper and compensation matters and apply what we have been saying to the classes of the community which are of supreme importance, viz. the working, trading, industrial, and professional middle classes.

Here, I am sure, you will all agree with me when I say that whether men or women, whether doing military, government, or civil work, these have all been trenching on their reserve power since the war began to an extent which they never did before. We doctors know this from what we have seen among our patients and friends, and we know it also as regards ourselves and our

nurses. Specially was this the case during the autumn of last year and the spring months of this. Indeed, one often felt that during the stress of work then, nerve and physical strain was approaching somewhat perilously near the hysterical or panic stage.

What I would say, therefore, is that as regards our own country at least in spite of the favourable inferences which might be drawn from these mortality, poor law, and other statistics, there has been a continued nerve tension and strain in the community and consequent widespread lowering of its disease-resisting power, and that this, like the camel's back, which does not break till the last straw has been applied, has not yielded till the latter half of 1918. Moreover, when we call to mind the maxim in science of the late Professor Huxley, viz. that the conditions which favour the life of an organism are those which, if persisting long enough, can bring it into existence, we can believe that what has been said may apply to both of the main factors of an epidemic — that is to say, to virulent transformation of an organism or organisms as well as to increased susceptibility of the individual.

I am well aware that a multitude of other communal factors could be cited as having been at work in our own country—overcrowding in factories, barracks, and shipboard, insufficient or less nourishing food, low temperature, and less heating facilities, etc., and I am also aware that a study of the causation of the disease over Europe and over the rest of the world would reveal additions to these. Inasmuch, however, as to my mind influenza is, like cerebro-spinal fever, a disease in which the nervous system is primarily involved, I am of opinion that investigation of the sociological conditions of the community, as influencing its medical or psychological health standard, can yield information of great interest and value.

Sir Robert Philip said it seemed clear that the recent epidemics of influenza were similar in character to those which proved so serious from 1890 onwards through the early nineties. Those of them who had an opportunity of observing the earlier outbreaks would recall vividly the sudden commencement of the epidemics, their wide prevalence, their extremely grave character, and especially their toxic influence over the circulatory and nervous systems.

These features were all paralleled in the recent epidemics. There was this difference, that those who were working in 1889-90 and onwards had no facts or experience with which to compare the sudden and the new, while some of them at least, who were working at present, had the previous experience with which to compare.

Unfortunately, now as then, the essential causal factor remained doubtful. None of the suggested organisms had been authoritatively accredited. It was remarkable indeed that, while in the course of the last series of epidemics the organism described by Pfeiffer came gradually to be accepted, it had been now relegated—for the most part in Allied literature at least—to a back place. He hesitated to accept the view that the responsible organism was merely one of the frequently occurring organisms which for the time had taken on more virulent characters. A disease occurring so abruptly, spreading so universally, and presenting such grave features—a disease which had been responsible in the recent epidemics for at least twenty thousand deaths in Scotland and for deaths running into millions in India—must have for its

essential cause one organism. For the present, all that could be said was that that organism had not yet been determined.

Certain broad facts had been established during the earlier epidemics which the more recent outbreaks had served to confirm. One of these was that attacks were less common and serious in communities—institutions and households—whose life was led to a great extent in the open air. It was a frequent observation in the earlier epidemics that hospitals and other institutions conducted on open-air lines suffered relatively seldom. This applied to households also. The experience had been paralleled strictly in the present instance. In the first of the recent outbreaks, for example, one or two cases only occurred in the open-air institutions with which he was acquainted, and the cases were of the slighter sort, while in the later outbreak no case at all had occurred. In keeping with this was the observation that when cases in private were placed on such lines in the largest measure, remarkable improvement was registered, and families and individuals who adopted the method, with a view to prevention, in large part escaped.

Had the pre-existence of tuberculosis any relationship to the occurrence and the course of influenza? In the foreground there was no evidence that tuberculous patients were more liable to attack, if their manner of life was physiological, that is to say, on sanatorium principles. The open-air institutions to which he had referred were especially those concerned with the treatment of tuberculosis. On the other hand, when a tuberculous patient was attacked by influenza, whether the influenza attack was severe or slight, the tuberculosis itself — particularly pulmonary tuberculosis — frequently became aggravated, and this sometimes in severe degree. Even at the best, patients lost weight rapidly, and it took long to bring them back to the point which they had reached when the acute illness started.

Further, he had observed that existing physical signs within the lung due to tuberculosis, sometimes changed rapidly, and doubtless some of the cases of influenza, where physical signs were most extensive and unusual, were cases where tuberculosis had existed previously. Sometimes the advent of influenza led to the detection of existing tuberculosis in cases which had previously escaped observation. There was no evidence that influenza paved the way for a primary tuberculous infection.

Speaking broadly, perhaps the most justifiable deduction from both series of epidemics seemed to him that, in proportion as the principle of open-air life, that is to say, life lived day by day and night by night in relation to the open air, was faithfully maintained, risks of influenza were lessened — the risk of getting it, and, what was more important, the risk of getting it badly.

Dr. James Ritchie (*Primus*).—Those who have had experience of many epidemics of influenza have doubtless been impressed by the variations in the symptoms in individual cases, by the variety of systems affected in different persons during the same epidemic, by the marked differences in the characteristics of different epidemics, and probably, most of all, we have been impressed by the profound effects of the poison on the nervous system. These effects have been exhibited in all the epidemics in at least a considerable proportion of the cases. This influence is shown in a variety of ways, such as the sudden prostration at the time of invasion, various evidences of the paresis of vaso-motor nerves, the lowered vitality of the patient, the frequently protracted

recovery, an increased liability to other illnesses for a time thereafter, and an increased mortality from other illnesses which succeed an epidemic.

The differences in type are doubtless partly due to differences in the constitution of the patient; for example, two members of the same household were bowled over on the same day; the one had a temperature of 103° for three days, but at the end of three weeks was able for duty and appeared to be in her usual health; the other had no rise of temperature, but, although he thought himself to have been in his usual health before the illness, and attempted work, it was at least eight months before he was able for it. In neither case was there any complication. The state of health at the time of the attack doubtless affects the nature of the illness. The type is affected, also, by the virulence and the dose of the poison received into the system, by the influence of associated organisms, which may be to increase or to diminish the virulence of the influenzal microbe, also, if any of these associated organisms are pathogenic, the lowered vitality of the individual due to the influenza may allow these pathological organisms to produce their own specialty.

In the two epidemics of 1918 the speaker observed the following peculiarities, viz. a greater tendency to pneumonias of influenzal type. In the early stage many influenzal patients had marked redness of face, chest, arms, and hands (in addition to the injection of conjunctivæ so common in previous epidemics); hæmorrhages were more frequent (from nose, pharynx, and larynx); and in menstruating women the flow was sometimes very greatly increased. Some patients had somewhat high temperature (104° was common, 105° not infrequent) for three or four days, then a somewhat rapid subsidence; in some the cough was extraordinarily hard, dry, persistent; some cases not severely ill had impaired percussion over the bases of both lungs, with poor respiratory murmur. The peculiarity consisted in the length of time which these symptoms lasted—well into the recovery stage.

As to treatment. Former experience was fortified, viz. that the sooner an influenza patient took to bed the less was the probability of serious complications. The poison has such serious effects that, in most cases, it requires all the physiological energy and conservation of that energy to overcome it. Those patients who laid up at once were, as a rule, less seriously ill than those who endeavoured to continue at work. The foul air of 'tween decks and the fatigues of a long journey were doubtless responsible for the very serious condition of many of those who arrived "on leave" from abroad. Another point of great importance is that every patient who is recovering from influenza should be kept in bed not only till the afternoon temperature is normal, but also until the percussion and auscultation of the bases of both lungs is normal. The temptation is great, if the illness has been protracted and the patient feels well, to allow some liberty; but the speaker believes that it was chiefly because of care in this respect that, although he treated a considerable number of somewhat severe cases with influenzal pneumonias, three of whom had extensive pleurisy, he had only one unfavourable complication arising after recovery had apparently set in, viz. the case of a lady at term who had suddenly taken ill with influenza the day before confinement, temperature that evening 102°. The involution and other changes connected with the confinement took place normally. She had pneumonia of one lung which seemed to have reached the recovery stage; for twenty-four hours she

was apparently normal, then the other lung became affected, and she succumbed. For pyrexia, the speaker used cool sponging at ten minutes intervals, and, if this failed, an ice-bag to the epigastrium. He never prescribes as antipyretics antipyrin, phenacetin, and such-like drugs. For pains in loins and limbs, which frequently caused much suffering, he gave 7 to 10 grs. of natural salicylate of soda four times a day, with sodium bicarbonate if the urine were very acid ; if not so, then with liquor ammoniæ acetatis. So soon as the pains were relieved, and in some cases from the beginning, he gave stimulants, either carbonate of ammonia or aromatic spirit of ammonia with tincture of nux vomica, tincture of capsicum, and infusion of cinchona, and if the cough were troublesome he added potassium iodide in small doses (frequently 3 grs.). These medicines are more palatable if liquid extract of liquorice is added. The speaker believes that alcohol lowers phagocytic action —a most important action in micro-organismal diseases—and that alcohol also throws increased work on the lungs, therefore he never prescribed it in influenza, with one exception, viz. the fatal case already referred to. This, along with that of an elderly gentleman, who two years before had a serious cerebral hæmorrhage, were the only deaths which occurred in his practice from influenza. He has no experience of treatment of the disease by vaccines.

Lastly, and most important, prophylaxis. In his estimation the most important measure is attention to the general health. Probably few of the general public realise the great value from the health point of every breath which we draw and the prejudicial influence of foul air, specially germ-laden air, not only on comfort but on the power of resistance, and that if that foul air contains the microbe of influenza, the system is little able to deal with it. The speaker therefore strongly recommended those who consulted him as to prophylaxis that they should attend to their general health and also to avoid crowded meetings. As to the prophylactic value of vaccines he desires further information. The vaccine recently used would at least tend to protect against catarrh and pneumonia. If the fact of having received vaccines gave the recipient a sense of security, it would, by raising the nervous tone, help to increase the power of resistance. There was also the responsibility in not giving a vaccine that if the person afterwards took the disease there might be recrimination. The speaker gave the vaccines (R.C.P. Laboratory vaccine) to all the members of his own household and also to the households of several patients who desired it. None of the vaccinated persons took the disease, but the total number of these was not sufficiently large to generalise from.

Dr. R. A. Fleming said, I wish to refer specially to the severe types and also to the complications of the influenzal epidemic as I saw it in military patients in Edinburgh, and to offer such suggestions for treatment as experience afforded.

At the height of the waves of the epidemic in last November and early spring of this year the fatal cases might be divided into three groups :—

1. The toxæmic type of influenza in which the patient showed the typical heliotrope colour and an intense toxæmia with enlargement of spleen. Such cases usually proved rapidly fatal.

2. Cases of influenza in which lobar or pneumococcal pneumonia developed. There was often associated with it a remarkable toxæmia, and pneumococci

were in several cases found in the blood besides the influenzal bacilli. In these cases there was generally a very extensive pleurisy, and, where the patient recovered from the pneumonia, there was a peculiar tendency to a secondary empyema.

3. Cases of influenza in which septic bronchitis, leading to broncho-pneumonia, developed. It is this type to which I want to refer in particular.

The first type with the heliotrope colour was almost always fatal: chance of recovery in the second type with lobar pneumonia seemed to depend upon the possibility of resolution occurring before the patient's strength failed. An extremely bad prognostic sign was the appearance of extensive pleuritic friction over a much wider area than the area of consolidated lung.

The third type, until special treatment had been devised, proved one of the most disappointing, as in fatal cases, and they were not rare, death did not occur until two to three weeks after the onset of the influenzal attack.

The majority of the military cases affording instances of all these types were strong, well-built young soldiers. Many of them had not taken proper precautions when the initial influenza commenced, but had endeavoured to carry on, and those on leave to utilise their holiday in Edinburgh by going to cinemas, etc., when they ought to have been in bed. One felt about the majority of the fatal cases that recovery might have occurred or rather that these serious cases might have been greatly diminished in number if treatment, or at least rest in bed, had been begun sooner.

There seems no question that the recent influenza epidemic gave an extraordinary opportunity for the attack on the patient of the pneumococcus and also of other pus-producing organisms, and perhaps this statement may be best proved by studying the life-history of the septic bronchitis type of cases. The physical signs suggested the rapid development of a bronchiectasis, that later the lung tissue in the neighbourhood broke down, and that the patient had to contend with an unusually virulent variety of pus-producing organisms both in the bronchial tubes and also in the lungs. It may be that the lung tissue was infected by these organisms through the bronchial wall rather than an extension of infection along the bronchial tubes to the terminal alveoli. The appearance of an extensive pleurisy was one of grave prognostic significance in this complication of influenza. I may add that we never found tubercle bacilli in the sputum in the cases I refer to, although the sputum was systematically examined. In this type of septic bronchitis the sputum was always extremely purulent and tenacious, and was spat up with the utmost difficulty. The persistently swinging temperature indicated a constantly increasing septic absorption.

The treatment which yielded the greatest benefit was steam inhalations. Useful in all influenzal cases in which there was much bronchial irritation, they proved invaluable in cases with septic bronchitis. The sputum became much more easily expectorated, and if lung destruction had not advanced too far, the constant use of steam introduced into a tent erected over the bed gave us excellent results. It did not much matter whether some antiseptic was used with the steam or not, pain was soothed and sleep obtained. Even in pneumococcal cases of lobar type, steam sometimes proved of benefit. Unfortunately we were unable to obtain anything like an adequate supply of methylated spirit for keeping up the continuous use of the steam kettle. In later treatment open air and postural coughing proved of great value.

We tried vaccines and serums for our pneumococcal cases, but without any marked benefit.

I made a point of endeavouring to keep up the strength of the heart by giving digitalis or strophanthus in every severe case of influenza from the first, and I only wish to add that strychnine hypodermically and pituitrin yielded excellent results so far as the heart was concerned. I am persuaded, notwithstanding statements to the contrary, that cardiac dilatation is a common result of influenza and that death is frequently due to it. Diffusible stimulants, and in particular spirit of chloroform, proved of value.

I might add that oxygen was used in a large majority of our patients and that it was of benefit in affording relief where there was intense dyspnœa and cyanosis, but that too often the benefit obtained appeared to be only temporary.

The insomnia of our severe influenzas was common to all types. Paraldehyde proved useless, while veronal and heroin gave the best results.

The severity of our cases rendered the death-rate high, but I want to pay a special tribute to Dr. Rankine and the sisters and nurses who spared no effort, thereby saving many lives by their assiduous attention and care.

Dr. Ford Robertson said he had found that therapeutic immunisation with sensitised vaccines generally cut short an acute attack of influenza within two days. He had carried out protective inoculation against the disease in over 130 cases, and the evidence seemed clear that a valuable measure of protection was afforded by this method. He wished specially to draw attention to the fact of the extensive prevalence of cases of chronic infection of the respiratory tract by the bacillus of influenza. He had investigated and treated (or provided for the treatment in) over seventy cases by therapeutic immunisation, during the last five years. This type of case was exceedingly important, but it was not at present recognised by the practitioner. The symptoms were always severe ; treatment by therapeutic immunisation was almost constantly successful. Among these cases there were at least three in which relapses occurred in the form of ordinary attacks of influenza. When the infection had been eradicated by therapeutic immunisation, these attacks of influenza ceased. Such cases furnished experimental proof that *bacillus influenzæ* was the cause of influenza.

An important point about the recent influenza epidemic in Edinburgh was that a considerable proportion of what had been regarded as influenza was really an acute infection, not by the bacillus of influenza, but by the closely allied Bordet-Gengou bacillus of whooping-cough. He knew of an instance in which this form of infection had been brought by a Colonial soldier who had spread the malady in an acute form in every house he visited. Investigation of a case showed that the infecting organism was a Bordet-Gengou bacillus. This form of infection in the adult caused a very irritable spasmodic cough, which often continued for several weeks.

THE BACTERIOLOGY OF THE INFLUENZA EPIDEMICS OF 1918-1919.*

By W. R. LOGAN, M.D., M.R.C.P.(Edin.).

In this brief paper on the bacteriology of the influenza epidemics of 1918 and 1919, I shall take in turn the various groups of organisms which have been shown to be associated with the cases.

Pfeiffer's Bacillus.—Reports as to the presence of Pfeiffer's bacillus have been very conflicting. In some areas this organism has been isolated from the great majority of cases even although the medium used has not been particularly suitable. In other areas, apparently similar media being used, Pfeiffer's bacillus has been found only in a minority of cases. Where media particularly suitable to the growth of Pfeiffer's bacillus have been used, such as Matthew's medium, the result has usually been the isolation of Pfeiffer's bacillus in a great majority both of simple uncomplicated cases and of cases with pulmonary complications.

It has to be noted that failure to isolate an organism such as this is not to be interpreted as meaning that the organism is not present. In other words, if Pfeiffer's bacillus is isolated from, say, 80 per cent. of cases, it is probably more nearly correct to assume that it is present in 100 per cent. of cases than that it is present in 80 per cent.

The work that has been done by Fleming and others has shown that Pfeiffer's bacillus has played a definite part in the epidemic, but whether primary or secondary it is not yet possible to say; that, judging by serological tests, Pfeiffer's bacillus is probably not one bacillus but a group of bacilli, and that it will be necessary to examine a large number of normal people, using selective media such as Matthew's and Levinthal's, before the relative incidence of this group of organisms in normal people and in influenza cases can be determined.

Filter-passers.—Knowledge upon filter-passers in influenza is still very incomplete. The difficulty of working with filters is known to be very great. Bulloch and Craw, working in 1909 with Berkfeld filters, found that 90 per cent. of the candles tested allowed contaminating bacteria to pass through, presumably because of flaws in the candles. In the second place, the Noguchi method of cultivation used is one in which it is peculiarly difficult to avoid contamination. In the third place, the results so far published of attempts to transmit the disease to animals have been very unconvincing, though this in itself is probably not very important, as such experiments can never have the value of

* Based on an interim report to the Medical Research Committee, from the Royal College of Physicians, Edinburgh.

experiments on human beings. Lastly, in thirty-four experiments by Friedberger in which filtered material from influenza cases was sprayed on the throats of human beings, influenza was not produced in a single case.

The Pneumococcus and Streptococcus Groups.—As I have been working on these groups of organisms in influenza I shall give briefly the results of my own experiments so far as they have gone; they are not yet complete. The cases studied have been nearly all Edinburgh cases, and the work was done in the R.C.P. Laboratory.

In the first place the differentiation of pneumococci and streptococci from each other requires a series of rather complicated tests into which it is not possible to go here in detail. It is sufficient to say here that the methods which are frequently used are entirely inadequate. It is impossible, for instance, to distinguish pneumococci from streptococci by their morphology. As an example, true pneumococci, proved to be such by a series of tests, including serological tests, frequently grow in long chains in fluid media; on the other hand, the common diplo-streptococcus of the mouth usually grows as a small oval or pointed diplococcus, with, when stained by Gram's method, an unstained halo round about; that is, this streptococcus has the appearance often regarded as typical of a pneumococcus. The organisms which I refer to in this summary as pneumococci and streptococci have been proved to be such by the series of tests referred to, chief among which are the bile test and mouse inoculation.

In the last few years it has been shown, chiefly by American workers, that pneumococci are composed of several distinct types. They have been able to separate three definite types, called, for convenience, types I., II., and III., which have been chiefly associated with cases of pneumonia, although also found occasionally in normal mouths and throats, and type IV., which should really be called group IV., as it contains an unknown number of varieties. Members of group IV. are more often found in normal throats than are types I., II., and III., but some at least of its members may also be associated with pneumonia. This group still awaits a correct classification.

The Pneumococci of Edinburgh Cases.—The results of the cases which I have so far examined can be given in tabular form. In 107 cases the examination as regards pneumococcus is sufficiently advanced to give figures.

Table 1.—Cases Examined by Means of Throat Swabs.

	Cases Examined.	Pneumococcus Isolated from
Pure influenza in early stages . . .	41	5
Influenza with pulmonary complications . .	8	4

Table 2.—Cases in which the Sputum or Lung-substance was Examined.

	Cases Examined.	Pneumococcus Isolated from
Pure influenza in early stages	3	1
Influenza with pulmonary complications	54	44

In addition, in one case of influenzal pneumonia blood culture yielded a pneumococcus.

That is, in the pure influenza cases pneumococci were isolated from 6 out of 44, or 13·6 per cent., while from influenza cases with pulmonary complications pneumococci were isolated from 49 out of 63, or 77·7 per cent.

In the Edinburgh cases, therefore, the pneumococcus was an important, perhaps the most important, factor in the pulmonary complications of influenza, but was not the cause of uncomplicated influenza.

Types of Pneumococci from Edinburgh Cases.—Fifty-one strains of pneumococci from thirty-four cases have up to the present been tested with the Rockefeller sera types I. and II.

Of these thirty-four cases, three have yielded a type I. pneumococcus, three a type II. pneumococcus, and from two pneumococcus mucosus, which is type III. pneumococcus, has been obtained. From the remaining twenty-six cases pneumococci of group IV. have been obtained, and these are being at present studied with a view to dividing them into serological subgroups. Cultural and other tests make it practically certain that these strains belong to a variety of groups.

The point of importance is that the pneumococci present in these cases do not belong to one but to many types, which, judging by the clinical course of the cases, apparently vary greatly in their pathogenicity. The multiplicity of type does not augur well for the attempt to treat by specific sera. There is only one type of pneumococcus against which an effective serum has so far been obtained (at the Rockefeller Institute), but it would be well if a supply of this serum could be obtained in this country as soon as possible, seeing that I have shown type I. pneumococcus to be responsible for a certain number of cases in this country. Two of the three type I. cases have already proved fatal, and the outcome of the third I do not yet know. Type I. serum is only effective in cases due to type I. pneumococcus. It has no effect on other varieties of pneumococcus.

The Streptococci of Edinburgh Cases.—Streptococci have been isolated from all of 120 cases examined in Edinburgh, that is, from 100 per cent. of cases. These include cases at all stages and of all degrees of severity—cases of pure influenza and cases with pulmonary complications. An attempt is being made to classify the streptococci by various serological and cultural tests. This work is not complete, but

at the present moment it may be stated that there is a number of different varieties, and probably a *large* number of different varieties. In a certain proportion of cases they are of the hæmolytic type, which is generally regarded as pathogenic. There is at present no reliable means of distinguishing the majority of the strains from those which are habitually present in normal mouths and throats. The great majority are morphologically the oval diplococci which have been wrongly called pneumococci by a number of observers.

Therefore, so far as the streptococci are concerned, I can at present only lay stress on the fact that they were obtained from all the cases examined, and that, as with the pneumococci, there is a multiplicity of type.

I hope, with the permission of the physicians who kindly allowed me to collect the material from these cases, later to obtain the main clinical facts chiefly as regards the severity of illness and the outcome. There is no question that the course of the illness depends on the particular type of organism which is present, not on the main group to which such an organism belongs. That is to say, when a bacteriologist reports, for example, that a streptococcus is present he is not giving information which is of any value to the clinician. The streptococcus may be a perfectly harmless saprophyte or it may be extremely virulent. The work on which I am at present engaged is an attempt to type out these streptococci and those members of the pneumococcus group which have not yet been typed.

As regards other organisms met with, the chief one, as far as the Edinburgh cases is concerned, is staphylococcus aureus. This, as might be expected, was associated with a very purulent sputum and a very septic condition of the lungs.

In concluding, I should like again to point out the multiplicity of the types of organisms found in these cases. It leads one to speculate as to the possibility that in looking for a specific virus of influenza one may be looking for something which is non-existent. In this connection it is interesting to note M'Carrison's recent work on vitamines in which he has shown that the absence of certain vitamines from the diet renders animals liable to the attack of common micro-organisms to which they are ordinarily resistant. I should like to hear the views on this subject of those more competent than myself. I suppose there is no question that in the latter part of the war the diet of many people was deficient in certain vitamines. Margarine, for instance, contains none of the fat-soluble A vitamin which is contained in butter fat, and which is regarded as being so important to health.

At all events, whether one regards the epidemic as due to a specific virus or as being consequent upon altered conditions in the bodies of human beings, there is no question that the morbid conditions produced are caused by a great variety of micro-organisms, the virulence

of which must have become enhanced during the epidemic, and that in our present state of knowledge any preventive vaccine, to be effective, must be prepared from a great number of bacteria, including all the known pathogenic types met with in these cases.

For permission to obtain material from cases under their charge, I am indebted to Drs. R. A. Fleming, Chalmers Watson, J. Eason, J. J. Graham Brown, and J. S. Fowler.

Dr. M. Dewar referred to the incidence of influenza in his practice from June 1918 to April 1919. The number of cases on his total list rose from 13 per cent. in June to 22 per cent. in July; they then fell gradually to 5·4 per cent. in September. A re-accession took place in October, up to 26 per cent., rising to 35 per cent. in November, falling again in December and January to 18 per cent. A very large increase took place in February, 48 per cent., falling to 20 per cent. in March, and rapidly to 6·5 per cent. in April, after which, so far as his practice was concerned, the epidemic ended.

There was one death in each of the three months, July, November, and February. Judging from a sporadic case occurring now and again, he is inclined to believe that the germs of influenza are never absent, the disease being liable to break out under conditions favourable for it.

No one in the series treated by prophylactic vaccines developed influenza. As the number was small, however—about a dozen—not much value can be attributed to the results.

The general treatment in all cases was that the patients were put to bed and kept warm, with strict attention to diet and regimen. He always began the treatment with a mild purgative. Sometimes a diaphoretic mixture—aspirin tablets where the headache and body pains were severe—usually ended in convalescence in from four to eight days; more severe cases lasted from ten to fourteen days. In intermediate cases with some bronchial catarrh warm applications to the chest were applied, and a little opiate, such as chlorodyne or camphorated tincture of opium, was added to the mixture, which usually proved sufficient.

The essential thing in complicated cases is to diagnose the condition as early as possible by studying the temperature and pulse, and making a faithful clinical examination of the chest, abdomen, and brain.

Bronchitis was treated in the ordinary way—soothing mixtures in the early stages when the cough is troublesome and the secretion scanty, and stimulating mixtures in the later stage, either with warm fomentations or the kettle. The treatment adopted in broncho-pneumonia was much the same as in bronchitis, followed by the use of Unguentum Iodi Denigrescens on the chest, front, and back. The pulse was closely watched and, where necessary, strychnine, digitalis, and alcoholic stimulants were administered.

Lobar-pneumonia, including double pneumonia: The application of small blisters; the use of quinine, digitalis, or strophanthus as was considered judicious; alcohol in small and steady doses, followed for a time by strychnine and digitalis.

His experience of meningitis in the late epidemic was not happy. The one case—a young lady—proved fatal in a few days.

The question of alcohol in influenza is a difficult one. He never used it in mild uncomplicated cases, nor even in intermediate cases with slight

complications, but in marked broncho-pneumonia and lobar-pneumonia, with a tendency to a soft, flagging pulse, independent of whatever the temperature might be, he had no hesitation in using alcohol freely, according to the age, temperament, habits, and general condition of the patient.

The mortality, during the epidemic from June 1918 to April 1919, of 0·7 per cent. is sufficient evidence that the method adopted was a fairly sound one.

Dr. Frederick Porter.—I wish to submit certain observations in regard to treatment. Before doing so, however, I would like to refer briefly to a few clinical points which others may have noted.

1. The epidemics of July and October-November 1918, and January-February 1919 occurred with increasing severity. The January-February epidemic calls for special remark owing to its severe pneumonic type.

2. The principal symptom, and one which called for most urgent relief, was persistent cough due to tracheitis. In every severe case I attended the trachea appeared to be first involved, and in a large number of those cases I detected crepitations over the trachea on auscultation. Fortunately, however, in the majority of those cases the inflammatory condition extended no further, but when the crepitations extended to the right or left of the mid-sternal line the case was one of pulmonary pneumonia and, I suspect, complicated by the presence of the streptococcus.

3. The number of serious cases where there was no increase in the pulse-rate, and the temperature was normal or subnormal.

4. Quite a number of patients consulted me for sore throat, which they attributed to a fish bone having stuck in the throat while partaking of breakfast. In none of those throats was a fish bone detected, and in all of them it proved to be symptomatic of influenza.

5. In the interests of medicine I think it might be considered if it would not be expedient to chronicle the October-November 1918 and January-February 1919 epidemics as pneumonic plague, while it might be wise, in the public interest, to adhere to the term "Influenza."

Treatment.—*Children*, I found, did best without drugs. Simple diet, plenty of water and fresh air, tepid sponging to reduce high temperature, attention to the bowels, and, in large families where there was a tendency for four or five to lie in one room, an insistence on separating them to as many rooms as were available.

Adults.—With one exception I found no drug of any specific value. Salicylate of soda, quinine, aspirin, etc., did no more than temporarily relieve headache and pyrexia. This fact alone distinguished those epidemics from the accustomed annual visitant. In cases of delirium I found hyoscine of considerable benefit, and I believe that large doses of quinine and perchloride of iron did good in certain cases of septic pneumonia. The exception I will refer to later.

Vaccine.—I found the mixed influenza vaccine as prepared by Duncan, Flockhart & Co. of great value, and I have no hesitation in saying that it was the means of saving at least two patients who were in a dangerous condition from influenzal broncho-pneumonia. One patient, a woman of 54 years of age, had been ill for eight days, with a high swinging temperature and a dilating heart, to whom I gave a full dose of the No. 1 vaccine. Her temperature fell to normal in twenty-four hours. Three days later it rose to 101·4, and I gave

a full dose of No. 2 vaccine, the temperature reaching the subnormal line in twenty-four hours, with a permanent result. The second case was of a similar nature but more acute, but the result was entirely satisfactory. One point I think worthy of notice in vaccine treatment is the fact that in all the cases I treated I gave the maximum dose as the initial dose, and I never observed any evil effects whatever. I had a similar experience in inoculations for prophylaxis, not a single case even complaining of malaise.

The drug I wish to refer to, and I do so now, as I had regarded vaccine treatment superior to any I had previously administered, and with further knowledge and experience of its use I believed that we had the means of contending with, if not of preventing, this serious scourge. I feel it, however, a duty to submit to you the result of my experience with the administration of phenol, as I feel justified in stating that this is a worthy antagonist of vaccine, if not superior. As soon as the phenol treatment gained notoriety through the Press I started prescribing it, but I was disappointed with the results. I now know this was due to ignorance regarding the proper mode of administration. I started giving $\frac{1}{4}$-gr. doses every four hours. A certain number of patients received relief but the general result was disappointing, a relapse occurring in many cases. I continued to prescribe it, however, and I gained courage to administer it more frequently—every two hours, then every hour, with totally different results. I now prescribe it in $\frac{1}{4}$- to $\frac{1}{2}$-gr. doses every hour, and I feel, with more experience, larger doses could be reached with safety and probably with better effect.

It would appear that phenol is only effective when the blood receives a certain amount, as a certain percentage is apparently required to kill the invading organisms. I believe the point to observe in administration is the urine, and I found when the urine presented the dark brown to black colour of carboluria, the phenol was being given in sufficient quantity, and this condition I believe should be reached in approximately twenty-four hours from the commencement of administration.

A medical practitioner of over 70 years of age sent for me. His temperature was 103·4° F. He had incessant cough, throat was intensely painful and congested with œdematous uvula. There was a patch of pneumonia in left apex, with consolidation of the whole left base. There were crepitations over right base. He had cough incessantly for three days and had no sleep. He had administered, himself, three injections of vaccine. I prescribed $\frac{1}{4}$-gr. doses of phenol every hour. I saw him next morning, when I found he had taken fifteen doses. His temperature was normal, headache had disappeared, and the cough had practically gone. He could swallow without any difficulty, and he informed me that he obtained relief after the second dose. I advised him to continue the phenol every two hours during the day, but he persisted in taking it hourly till he noticed his urine was almost black, when he desisted. Two days later he coughed up a cupful of sputum which was practically pure pus. His recovery was uninterrupted.

Case of acute bronchitis (influenzal)in a man of 62 years. Phenol administered on the fourth day in $\frac{1}{4}$-gr. doses, with similar speedy result.

Dr. W. T. Ritchie described the chief characters of the disease as observed in Egypt during 1918. The epidemic may be said to have started in October, and during the last three months of the year about 17 per cent. of the total admissions were for influenza. The onset of the disease was sudden, with

malaise, headache, pains in the back and limbs and eyes, cough was frequent, but nasal catarrh was infrequent. Bronchitis was neither a constant nor a pronounced feature, but congestion of the base of one or of both lungs was often detected. Gastro-intestinal symptoms were usually not notable. No characteristic rash was observed. The patient was acutely ill, his temperature reaching 102° to 105° F., with rapid pulse and marked asthenia. The fever usually fell by crisis on the third or fourth day; less often the fever persisted, with irregular remissions until the fourth or fifth day, and thereafter fell slowly by lysis, the normal level being reached about the ninth or tenth day.

The disease usually ran a mild course without any serious complications or sequelæ.

Coincidently with the epidemic of the mild disease described above there was a smaller but very severe and fatal epidemic of pneumonia.

The striking features of this disease were its acuteness and severity. The patient was suddenly struck down; within a few hours he was desperately ill, prostrate, cyanotic, his mucous membranes and skin of a blaeberry hue, his pulse weak and rapid; the physical signs in the chest sometimes clearly those of broncho-pneumonia, more often those of congestion only; the sputum scanty or, again, abundant and highly sanguineous, sometimes so much blood as to simulate the hæmoptysis of advanced tubercle of the lung. The tongue usually became small, dark brown, dry and rough, and the patient was often unable to protrude it. Nearly half the cases of epidemic pneumonia seen in October 1918 died. Post mortem the lung presented usually a confluent purulent broncho-pneumonia, but once or twice the consolidated areas closely resembled large infarcts.

Attention was drawn to the hæmorrhagic nature of the disease, to the bacteriology of the sputum and of the lung, to the irregular protracted course of the fever, and to the measures adopted in treatment.

INFLUENZA IN MACEDONIA.

By ALEXANDER GOODALL, M.D., F.R.C.P.

It may be of interest to refer to some of the features of influenza which I had the opportunity of seeing in other parts of the world. My first extensive acquaintance with the recent influenza epidemic was in June 1918. I was then in charge of the medical division of the British hospital for prisoners of war at Salonika. Information was received that an epidemic had broken out among Turkish prisoners at Ekaterina, that it had spread with great rapidity among the Turks but had shown little tendency to spread to their guards. We received orders to prepare an isolation compound for some of the worst of these cases, who were to be sent for observation and treatment. Thirty-five cases arrived by motor ambulance convoy on 16th June. Most of the patients had been ill for about ten days before admission. The common complaint was pain in the chest and cough, a few cases also complained of pain in the limbs, headache, and weakness. All of the thirty-five cases had physical signs of broncho-pneumonia. Sputum

was available for examination in fourteen cases. In all of these it was at first muco-purulent in character, but in a few cases it afterwards became gelatinous, and in eleven cases became blood-stained. In all the cases, except one which proved fatal, there was a leucocytosis with a very high polymorph percentage. Eosinophils were scanty. In fourteen of the cases the urine showed a pigment which gave Gmelin's reaction and a brown colour with nitric acid, and an indican reaction. One case had a general petechial rash, with some stiffness of the joints. This was regarded as rheumatic purpura complicating influenza and broncho-pneumonia. The treatment adopted was rest in bed in open marquees, such light diet as was available, and a mixture of iodide of potassium and ammonium carbonate. All the cases with one exception recovered. The temperature usually declined by lysis. The fatal case showed the usual changes found in broncho-pneumonia. None of the officers or sisters were infected, but in the ensuing weeks there were cases of mild influenza among the hospital personnel. The incidence of infection, however, was not specially severe among the hospital orderlies.

During July the incidence of influenza was very slight. In August I was transferred to a Serbian hospital and do not recall a single case. In September influenza recurred with extraordinary severity. The state of affairs in some of the Macedonian villages was appalling. In some of the mud hovels one saw men, women, and children lying literally in heaps. In the few cases one dared examine there were physical signs of either bronchitis or broncho-pneumonia. The stench was revolting, and the more seriously ill could hardly be seen for flies.

On 15th September the Serbs and French went over Dobropolje, and so enabled the whole Salonika force to advance over the terrible mountain barrier that had so long been its ambition, and hope deferred almost to despair. The Serbs advanced faster than their ambulances and supplies could follow them, with the result that it was generally at least four days before their sick and wounded reached hospital. We were then inundated with cases of influenza, malaria, blackwater fever, and wounds, some of which were infested with maggots, and there was no time to keep notes of individual cases. One has simply a recollection of strong men dying of influenza and pneumonia after an illness of a few days, of cases which were either influenza or malaria, or both, and of a type of case of chronic pneumonia which might last for months. These were cases with a very distressing cough, an abundant muco-purulent expectoration, physical signs of consolidation with crepitations, and very great weakness and emaciation. At first sight these cases simulated advanced phthisis, but tubercle bacilli were never found, and after weeks or months a slow but satisfactory recovery took place in about 50 per cent. of the cases. At this time the mortality among the British troops was very heavy, but I had no

personal experience of severe cases among them. Influenza affecting the officers, sisters, and personnel of our hospital at Vertekop was slight, and seldom associated with respiratory complications. Very few new cases were seen after the end of October.

Dr. C. M'Neil referred to his experience of influenza in the Scottish Red Cross Hospital at Rouen. During 1918 there were two epidemic periods of influenza. In the first, lasting through June to mid-July, about 400 cases were admitted into hospital, and there were no deaths. In the second, extending from mid-October to mid-December, there were about 550 cases with 28 deaths, giving a death-rate of 5 per cent.

An interesting clinical feature noted in a few cases (and both in cases with, and also those without, clinical signs of pulmonary catarrh and pneumonia) was an inverse remittent type of fever, never occurring in the early days of the disease, but in the second and third weeks, and either during a fall of temperature by lysis, or during a period of lower fever between 99° and 100° preceding the restoration of normal temperature.

On post-mortem examination a striking feature was the great extent of lung consolidation, this often involving the whole of three lobes. The naked-eye appearance of the cut lung was of a deep red and glistening solid tissue, lobar in its extent, but differing from the sandy dry surface of croupous lobar pneumonia. Among other post-mortem features were not infrequently pleural effusions, sero-fibrinous and sero-purulent, and also multiple kidney abscesses.

NEW BOOKS.

Malaria and its Treatment. By Captain A. Cecil Alport, R.A.M.C.(T.), M.B. Pp. xii. + 277. London: John Bale, Sons & Danielsson, Ltd. 1919. Price 21s. net.

The value of this book lies in the fact that it is purely a record of the author's extensive personal experience in the treatment of malaria in Macedonia. This excuses the slightly egotistical and dogmatic tone adopted throughout, and it is for the case records, not the preliminary sketch of the protozoology of malaria, that the book will be read. It is regrettable that Captain Alport has not had longer experience in preparing case records for publication; condensation and discriminating selection of the salient features would have made them easier to follow, and a certain amount of tabulation, showing the essential points, would have hammered his arguments home better than a series of case reports *in extenso*, which are apt to weary even one as diligent as the interested reviewer, who has read them all through from start to finish and regards them as valuable clinical records. Anyone who knows enough about the Salonica Army to read between the lines will find in Captain Alport's book a good deal of diversion, in addition to the interest of revived memories of convoys of exhausted, half-dead men—admissions such as no civil hospital ever sees. Quite early in the book, for instance, he tells how, wishing to drain a swamp, and meeting no encouragment from his O.C., he summoned a Macedonian mayor, and the Serbian and French commandants, and with their aid carried out the work. From the context one gathers that his hospital was a Serb one, somewhere in the French sector of the front, where the "brass hats" did not trouble or hamper these highly irregular unofficial proceedings. However, the swamp was drained right enough—and then the originator of the scheme was transferred to another sphere. Some of the cases, too, have a characteristic military flavour. Thus in case No. 8 of the blackwater series it is recorded, "The officer commanding the hospital [not now the Serb hospital aforesaid], after asking me for my opinion, told me he did not agree with me and took the patient out of my hands." Eventually the patient died and the first of the comments on the record is: "(1) I sent in my resignation as officer i/c of medical division and was sent to the front as M.O. to a field ambulance." This is a good illustration of one of the inevitable evils of military rank in a medical service: the physician in charge of the whole medical division of the hospital, and responsible for anything from 500 to 750 beds, with a staff of medical officers under him, practically superseded by the

administrative officer. There is much of interest in the book; to appreciate the subtleties one must have been in Macedonia and know something of the Army there.

War Neuroses and Shell Shock. By Lieutenant-Colonel F. W. MOTT, M.D., LL.D., F.R.S, with a Preface by the Right Hon. CHRISTOPHER ADDISON, M.D., M.P. Pp. 348. London: Hodder & Stoughton. 1919. Price 16s. net.

THIS book, which deals with one of the more important medical aspects of the recent war, is at the same time a valuable contribution to our knowledge of the basic phenomena of the neuroses and psychoses. The etiology of the commotional and emotional nervous and vascular disturbances which underlie neurasthenia and mental disorders is scientifically displayed from the pathological standpoint, with a convincing clearness which has probably not hitherto been attained to. It may seem ungracious to criticise the construction of a work, the matter of which is of such merit, but we feel that if the immense amount of material it contains had been classified in chapters it would have commended itself more to the ordinary reader; as it stands, it partakes rather of the nature of a work of reference.

The vexed question of psycho-therapy is not discussed but appears to be tacitly accepted as a recognised method of treatment, though by no means the sole or principal one. In his attitude towards the psychological aspect the author shows praiseworthy discretion. The merits of the psychological method are obvious, but Dr. Mott is primarily a pathologist and it would only have resulted in confusion if he had approached these important problems from the divergent standpoints of psychology and pathology. By adhering strictly to the pathological method he has succeeded in producing a scientific exposition of morbid neurology which will, we hope, definitely place psychiatry and the allied neuroses within the compass of general medicine and the ready comprehension of the profession. The book would be welcome for this reason alone, but the information it contains cannot fail to guide us safely among the intricacies and pitfalls of functional nervous diseases.

The Medical and Surgical Aspects of Aviation. By H. GRÆME ANDERSON, M.B., Ch.B., F.R.C.S. Pp. 255. London: Oxford Medical Publications. 1919. Price 12s. 6d. net.

ALTHOUGH, with the advent of peace, the interest in books on war surgery and military medicine has begun to wane, the present volume, dealing with a subject of increasing importance, cannot fail to interest

all those, now a goodly number, who are in any way connected with the science of aeronautics. It is the first book of its kind, and the author, whose repute as a surgeon is only equalled by his skill as an aviator, unfolds the story of the pioneer work of the Medical Department of the Royal Air Force in a manner well calculated to attract the attention of the reader, be he layman or doctor. Prior to the war, observations on the medical aspects of aeronautics were few, although the first balloon ascent in this country was made at Edinburgh, by a Scotsman named Tytler, as long ago as 1784.

During the past four years, however, we have learned much regarding the physiology and psychology of flying, and this knowledge has been turned to good account in estimating the suitability of candidates for aviation. The writer describes the various tests which he has found most suitable, many of them having been elaborated by Lieut.-Col. Martin Flack, who himself contributes a suggestive chapter on the applied physiology of flying. The psychology of aviation has also been the subject of much painstaking research which has yielded valuable results. "Keenness to fly" is perhaps the most essential attribute of the successful pilot. Under this heading, Surgeon Anderson gives a valuable psychological analysis of his own sensations during his first solo flight; then follows a good account of the aeroneuroses, which demand so much care and sound judgment in their handling.

Perhaps the most interesting chapter of the book is that which treats of aeroplane accidents. A "crash," in the majority of instances, is due to an error of judgment during landing, and this is most liable to occur at the time of the first or second solo flight. A unique series of photographs illustrates this section.

Dealing with the surgery of aviation, the writer remarks the frequency of two varieties of fracture. The first is a telescopic fracture of the lower thoracic vertebræ without injury to the spinal cord, the second is fracture of the astragalus. The latter, in civilian practice a rare event, is such a common injury in the Air Force hospitals as to justify the name of "aviator's astragalus." Details are given of its varieties, illustrated by a good set of skiagrams.

Short chapters on the effects of aeroplane bombs and on aeroplane dope poisoning conclude the volume, which will at once be recognised and adopted as the standard work on aeronautical medicine.

Surgical Aspects of Typhoid and Paratyphoid Fevers. By A. E. Webb-Johnson, D.S.O. Pp. 190. With 2 Coloured Plates and 26 Illustrations in the Text. London: Henry Frowde and Hodder & Stoughton. 1919.

It is more than twenty years since the publication of Keen's well-known work on the surgical complications of typhoid fever, and we

welcome the appearance of Colonel Webb-Johnson's book as a timely contribution to the literature of a subject which has been so little discussed of recent years in spite of the fact that the whole question has been so much widened by the recognition of the partyphoid fevers and by the practice of protective inoculation. After an interesting and well illustrated little summary of the history of the disease, the surgical aspects of the fevers are considered in detail and the pathology, symptoms, and treatment of each are successively dealt with. The clinical material on which the book is based consisted of 2500 cases of enteric fever, comprising a sufficient number of all the three varieties of the disease both in inoculated and in uninoculated men. The table, showing the incidence and mortality of the complications in the six groups of cases thus formed, is of particular interest and value, and the excellent results of inoculation are made very clear. It is of course unfortunate that the fact that the patients were practically all male and of military age renders comparison with the statistics of civil hospitals impossible. One is struck, however, all the more by the good results obtained even in the uninoculated. We have found the book both readable and instructive. It is well printed and the illustrations are good, the coloured plates, in particular, being very successful.

Chronic Traumatic Osteomyelitis: Its Pathology and Treatment. By J. Renfrew White, M.B.(N.Z.), F.R.C.S. Pp. xv. + 144. With 37 Illustrations. London: H. K. Lewis & Co. 1919. Price 12s. 6d. net.

In this monograph Mr. Renfrew White crystallises his experience, prefacing it with a systematic *résumé* of the physiology of bone and of the pathology of inflammation and repair in bone.

On this sound foundation rests his method of treatment for "the early and final cure of chronic osteomyelitis." The "ideal result," he contends, is "bone scar covered by skin of normal thickness and structure." This is procured in most cases by the "radical operation" which has for its object the obliteration of the bone cavity. This is obtained by subperiosteal resection of bone and mobilisation of the cavity walls, supplemented in certain cases, especially near joints, by a plastic operation in which a flap consisting of soft parts covered with sound skin is turned in over the cavity. For success the removal of sufficient bone is a necessity, to convert the cavity into a wide, shallow groove. No dependence is placed in the use of antiseptics or pastes applied directly to the bone during the operation. The Carrel Dakin method of irrigation is advocated as a preliminary to operation and as an essential procedure after operation, in order to minimise the intensity of post-operative inflammatory reaction. For the same

reason "it should be made an absolute rule to leave all such wounds widely open."

The details of the preparation for the radical operation, the steps of the operation itself and the after-treatment are stated at length and then collected in schematic form. The author is under no delusion as to the difficulties attending these cases, but is confident that much better results are obtained in the long run by the methods he advocates. His work is of high merit and of excellent execution, and the text is admirably illustrated by the plates and diagrams.

A Manual of Gynecology. By JOHN COOKE HIRST, M.D. University of Pennsylvania. Pp. 466. With 175 Illustrations. Philadelphia and London: W. B. Saunders Co. 1918. Price 12s. net.

THIS book is the outcome of an attempt to present in concise form the substance of the author's teaching on gynecology to his students. In many respects it is a praiseworthy effort, and the author has certainly succeeded in combining lucidity with a laudable degree of brevity.

There are always of necessity differences of opinion as to what ought to be left out and what retained in a small students' book, as this, although not specifically so labelled, is presumably intended to be; and when the comparison of views is between different schools of different countries these individual divergencies of view become magnified. In our view Dr. Hirst has erred on the side of retaining too much, and even of introducing extraneous matter. We fail entirely to see why the discussion of tumours of the breast or of the treatment of piles should be introduced into a gynecological book of this size, however arguable the case may be with regard to large text-books.

The pathology is disappointing and apparently does not bulk largely in the author's teaching, which on the practical side is sound and good. It is however surely unnecessary to describe the operation of curettage three times, even if the technique does differ slightly according to different indications.

NEW EDITIONS.

The Early Diagnosis of Tubercle. By CLIVE RIVIERE, M.D., F.R.C.P. Second Edition. Pp. xii. + 314. London: Henry Frowde and Hodder & Stoughton. Price 10s. 6d. net. (Oxford Medical Publications.)

IN view of the renewed interest which the prevention of tuberculosis has worked in the later stages of the war, a second edition of this excellent book arrives opportunely. Not everyone possesses the patience, or the capacity, to learn to discriminate between and evaluate as Dr. Riviere does the finer shades of percussion in the early diagnosis of the disease; but short of this, the most ordinary clinician cannot fail to perceive how comparatively crude and clumsy the average routine examination of a chest is when compared with that advocated. There is no doubt that stricter attention to quantitatively minor changes in light percussion would lead often to the recognition of unsuspected foci of disease, although the reviewer confesses that Dr. Riviere appears to him to exaggerate the importance of some of the phenomena he describes. What seems, however, especially praiseworthy about Dr. Riviere's work, is the prominence—one might almost say, pre-eminence—given to physical signs in the diagnosis of pulmonary tuberculosis. The important rôle which the detection of bacilli in the sputum plays in diagnoses has to some extent tended to lessen the confidence of the present generation in auscultation and percussion as signs of early disease; and the army regulation, which practically denies the possibility of diagnosis apart from the detection of bacilli, must have still farther confirmed this habit of thought among thousands of doctors. In fact, while all of us are willing to admit that the disease is diagnosable before bacilli appear, many hold this merely as a sort of pious opinion, and are unwilling to act on it where to do so involves the responsibility of putting patients to serious inconvenience, anxiety, and expense on what may not appear positive grounds. This, then, we regard as one reason for gratitude to Dr. Riviere—that he has once more shown that there are other methods of assuring the diagnosis apart from waiting until bacilli appear in the expectoration.

The chapter on hilus tuberculosis in the adult embodies a great deal of valuable original work. In dealing with tuberculosis in children—the same indeed applies to what he has to say about adults—Dr. Riviere insists on the distinction between a tuberculous infection and tuberculous disease. He is absolutely right, however, in regarding tuberculous infections in infants and young children as being invariably productive of active disease. It is interesting to note that he

apparently finds tuberculosis of the mesenteric glands less frequently than is the case in Scotland, thus confirming the observation that this form of tuberculous infection is more common here than in London. Dr. Riviere is more optimistic as to the prospect in pulmonary tuberculosis in children of school age than our experience here suggests, but we agree that the question is one of great difficulty. He rightly places radiography very high among methods of diagnosis in young children.

It seems to us that Dr. Riviere's book is a most useful one, and that it deserves both to be widely read and carefully studied.

Practical Obstetrics. By E. Hastings Tweedy, F.R.C.P.I., Professor of Obstetrics, Royal College of Surgeons in Ireland; and G. T. Wrench, M.D. Fourth Edition. Pp. 557. With 159 Illustrations. 1919. London: Henry Frowde and Hodder & Stoughton. Price 21s. net.

Professor Tweedy's *Practical Obstetrics* has in the last twelve or fifteen years made a definite place for itself in British obstetrical literature. It is essentially and avowedly practical in its aims, and it is needless to state that teaching based on a long experience as Master of the Rotunda Hospital is beyond cavil. This is by no means to say that the author always follows the beaten track of accepted views. On the contrary, some of his theories are distinctly individual, and of these he gives an interesting explanation. His theories, however, whether right or wrong, do not affect the proved efficacy of his methods, and that, after all, is the main point in a practical book on a practical subject. For example, one may entirely decline to accept the author's statement that "food is the actual exciting cause of eclampsia," and yet quite agree as to the wisdom of withholding food from an eclamptic patient.

Professor Tweedy has added a number of appendices, including the statistics of the Rotunda during the seven years of his Mastership. It seems a pity that the interesting material in these appendices is not more suitably presented, as appendices savour too much of afterthoughts to appeal to the average reader. The illustrations are practical, but of unequal merit from an artistic point of view.

The whole book is written in the fresh simple style characteristic of its distinguished author, and its study will provide both pleasure and profit.

NOTES ON BOOKS.

In *Irish Ethno-Botany* (M. H. Gill & Son, Ltd., Dublin, 1919) Dr. Moloney first catalogues the flora of Ireland from the herbalist's point of view, and then traces the history of Irish medicine from the age of the Druids, through the period of Princess Macha (B.C. 300), to the days of Finghin Faithliagh, physician to Conchubar MacNeasa, King of Ulster, A.D. 33, of the hereditary physicians of the Septs—the O'Cassidys, physicians to the Maguires, the O'Hickeys, physicians to the O'Briens, and others—until ultimately the period of Rotunda, Trinity College, and the Apothecaries' Hall is reached. A great deal of labour must have been expended on this sketch, and one cannot but hope that some day the author will expand it into a real history of Irish medicine. In the meantime it may be commended to those interested in the archæology of physic; notwithstanding the (to Saxon eyes) fearsome aspect of the Irish script, it is not really as Sinn Fein as it looks.

The contents and scope of Hinton's *Rats and Mice as the Enemies of Mankind* (British Museum (Natural History) Economic Series, No. 8, price 1s.) are sufficiently indicated by the title. The subject is of sufficient practical importance to merit the attention of doctors as well as laymen, and it would be difficult to find a better exposition of facts than this authoritative pamphlet.

So many cases of nerve injury and of functional and organic disease are now coming before Pension Boards, that such a guide as Dr. Muirhead Martin's *Pocket Notes on Nerves* (William Bryce, Edinburgh, 1919, price 2s. net) ought to have a good circulation on account of the mass of reference material compressed into its fifty odd pages.

Like Gaul, *The Whole Duty of the Regimental Officer* (Foster Groom & Co., Ltd., London, 1919, price 2s 6d. net) is divided into three parts: Duty to the State, Duty to his Unit, and Duty to Himself. Captain Wood's book is both thoughtful and suggestive; those who know the Balkans will realise what a fund of perseverance, equanimity, and sanity authorship in that benighted land implies.

The first edition of Col. Lelean's *Sanitation in War* (J. & A. Churchill, London, 1919, price 7s. 6d. net) appeared at the beginning, as this, the third edition, does at the close, of the war. It has been greatly enlarged since 1916, and is a thoroughly practical manual which has been universally appreciated.

Mitchell, Bruce and Dilling's *Materia Medica and Therapeutics* (Cassell & Co., London, 1918, price 9s. net) has been so frequently noticed in this *Journal*, and is so generally known to students all over the Empire,

that it is unnecessary to do more than refer to the eleventh edition, revised to correspond with the war amendments of July 1917 and March 1918, which has just been published.

Dr. Robert Keith has produced a handy little volume on *Clinical Case Taking* (H. K. Lewis & Co., Ltd., London, 1918, price 3s. 6d. net) which, though originally intended for the students of King Edward VII. Medical School, Singapore, deserves a wider circle of readers.

In *La Prothèse Fonctionelle des Blesses de Guerre* (Paris: Masson et Cie, price 5 fr.) Dr. Ducroquet, from his wide experience, has stated with masterly clearness the principles underlying the choice of and the application and fitting of orthopædic apparatus. The normal mechanism of joint and muscle movement forms the basis on which he builds his orthopædic appliances for support or correction. The illustrations are numerous, well drawn, and instructive.

Clinical Microscopy and Chemistry, by F. A. M'Junkin (W. B. Saunders Company, 1919, cloth, 16s. net), is an excellent book of reference for students and graduates. It is particularly useful in that it presents the subject from the laboratory point of view, and, dealing as it does with "side-room" work, gives the aspect of this work in which constant refreshment is necessary for the clinician. Not only is the technique of ordinary side-room work fully entered into, but description is also given of wider and more complicated procedures such as are carried out in a well-equipped laboratory or for experimental purposes. The concluding portion of the book is devoted to autopsy technique. The book is a convenient size, it is easy to read, and there is an excellent index.

BOOKS RECEIVED.

Barrett, James W.	A Vision of the Possible: What the R.A.M.C. might Become (*H. K. Lewis & Co., Ltd.*)	9s.
Best, Harry.	The Blind: Their Condition and the Work being done for Them in the United States (*The Macmillan Co.*)	$4.00
Binnie, J. F., Edited by.	A Treatise on Regional Surgery, by American and British Authors. Vol. I. (*H. K. Lewis & Co. Ltd.*)	32s.
Bradby, M. K.	Psycho-Analysis and its Place in Life (*Henry Frowde, Hodder & Stoughton*)	8s. 6d.
Caird, Francis M., and Charles W. Cathcart.	A Surgical Handbook. Eighteenth Edition (*Charles Griffin & Co., Ltd.*)	8s. 6d.
Cameron, Hector Charles.	The Nervous Child) (*Henry Frowde, Hodder & Stoughton*)	6s.
Cole, Sydney W.	Practical Physiological Chemistry (*W. Heffer & Sons, Ltd.*)	15s.
Giles, Arthur E.	Sterility in Women (*Henry Frowde, Hodder & Stoughton*)	10s.
Goodall-Copestake, Beatrice M.	The Theory and Practice of Massage. Second Edition (*H. K. Lewis & Co., Ltd.*)	9s.
Hare, Robert Amory.	A Text-Book of Practical Therapeutics. (*Henry Kimpton*)	28s.
Lea, Edgar.	Heart: Past and Present (*Bailliere, Tindall & Cox*)	7s. 6d.
Thomson, Sir St. Clair.	John Coakley Lettsom and the Foundation of The Medical Society (*Harrison & Sons*)	2s. 6d.
United States Army X-Ray Manual	(*H. K. Lewis & Co., Ltd.*)	18s.
Whale, H. Lawson.	Injuries to the Head and Neck (*Bailliere, Tindall & Cox*)	15s.
Worster-Drought, C., and Alex. Mills Kennedy.	Cerebro-Spinal Fever (*A. & C. Black, Ltd.*)	30s.

EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

Presentation to Sir Thomas R. Fraser.

In the Senate Hall of the University on 11th July, Emeritus Professor Sir Thomas R. Fraser was presented with his portrait, painted by Mr. Robert Home.

The Principal, Sir Alfred Ewing, presided over a large gathering of Sir Thomas's former students, academic colleagues, and personal friends. Prof. Harvey Littlejohn, Hon. Secretary of the Committee who had arranged for the presentation, intimated apologies from many of Sir Thomas's friends and pupils, including Prof. Crum Brown, Prof. John Chiene, Prof. Matthew Hay, and Sir W. Watson Cheyne, M.P.

Sir Alfred Ewing said that Sir Thomas Fraser was a professor in the University when he (Sir Alfred) was still an undergraduate, and in the long interval that had passed since then his services to scientific medicine had been such that his life might well be summed up in the phrase, "A Chapter of Medical History"—a chapter the end of which he rejoiced to think was not yet.

Sir James Affleck, in handing over the portrait on behalf of the subscribers, said :—

"When Sir Thomas Fraser recently retired from his Chair it was felt by his colleagues, former pupils, and friends, that this event could not be allowed to pass without some tangible expression of the esteem in which he was held, and of their sense of the splendid service he had rendered to the University and Medical School, the Royal Infirmary, Edinburgh, and indeed to the whole world of medicine, for the long period of over forty years.

"Accordingly the matter was taken in hand by a Committee, and an effort was made to induce Sir Thomas to sit for his portrait, which was happily successful, and the work was placed in the hands of an artist who proved to be in perfect sympathy with his subject.

"It would ill become me in his presence to use the language of adulation; but there are facts, and impressions, and memories which cannot be omitted from notice on an occasion like this.

"From the outset of his career Sir Thomas Fraser's work proclaimed him marked out for great things in his profession, and the years which followed fully justified that anticipation; so that when in 1877 he was called to succeed his great master, Sir Robert Christison, in his Chair, the whole medical world approved the choice.

"It is impossible for me at this time to enter into details of Sir Thomas Fraser's work as a professor and investigator (even were I competent to do so) further than to state that the fruit of that work produced important contributions to the therapeutic resources of the physician which have stood the test of time, and will always be associated with his name, and which moreover shed a lustre on our University.

"Sir Thomas Fraser's work in the Royal Infirmary (with which as one of his colleagues I was well acquainted) proved him to be a physician and clinical teacher of the first order, and thousands of his students, who during his long service there passed through his hands, are to-day in all parts of the world, putting in practice the precepts of thoroughness, accuracy, and honesty in the investigation and treatment of disease, of which he himself was so conspicuous an example in all his own work.

"In all he undertook he gave the impression of the scientific spirit and the mind of the seeker after truth.

"Whatsoever his hand found to do—and it found plenty—he did with all his might, and difficulties only served to stimulate to increased effort.

"But the energies of Sir Thomas Fraser were not limited merely to the duties of his Chair. The numerous and important positions he was called on to fill—Member of the University Court, Member of the General Medical Council (where he did excellent work in the cause of medical education), President of the Royal College of Physicians, Edinburgh, President of the Indian Plague Commission, and other appointments under the Crown—are but a few examples. They bore testimony to him as a man of affairs in whom professional and public confidence could be reposed.

"Honours and distinctions from Universities and from learned Societies, both at home and abroad, came in abundance; while his knighthood, and especially his appointment as Honorary Physician to His Majesty the King in Scotland, were gratifying acknowledgments of his eminent merits.

"Those who know Sir Thomas only as a scientific worker knew but part of the man and little realised how behind that weight of scientific learning there lay a genial and warm heart, which was revealed mostly to those who enjoyed his intimate friendship.

"These few halting words of mine convey but an inadequate impression of the man whom we have to-day met to honour, and the only reason for complying with the request that I should occupy the position

I do in this interesting ceremony is that I am perhaps the only one available among his old and intimate friends to undertake the duty which I have done with singular pleasure.

"That duty I should not consider discharged did I not in a word refer to the gentle lady who has been his companion through all his active and strenuous life. Lady Fraser has throughout been an unfailing strength to his heart, and, amid all the difficulties, the vicissitudes, and the trials through which they have been called to pass, has proved, by her courage, her sympathy, and her sweetness, a true helper and made it possible for him to do the work he has done.

"It only remains for me to ask you, Sir Thomas, to accept this portrait from your friends as a mark of their appreciation of your work and a token of their affectionate esteem."

In acknowledging the presentation, Sir Thomas Fraser said:—

"Although I cannot pretend to be unaccustomed to address audiences, I confess I have had a great difficulty in finding words adequate to express my feelings of profound gratitude for this most valued expression of the great kindness of many of my friends.

"It forms the culmination of many kindnesses I have received during my exceptionally long professional and academic career of between forty and forty-five years, in which, I may be permitted to say, my life has not been an inactive one.

"This long tenure appears to be almost one of the characteristics of the Professorship of Materia Medica. My immediate predecessor, Sir Robert Christison, filled the Chair for forty-five years, having previously been Professor of Medical Jurisprudence for ten years.

"It has possibly the advantage of giving time to add experience to experience, which may be of value to a teacher and also to an experimenter, so long as enthusiasm survives.

"It has allowed me to take a share in the training of between 6000 and 7000 men, who constitute as a body the best qualified practitioners of medicine and surgery in the British Empire.

"It has given me the opportunity, often in conjunction with Sir William Turner, of defending, in the lobbies of the Houses of Parliament, several important University privileges rendered precarious in Parliamentary Bills; of taking a suggesting and promoting part—especially when, for twenty years, I held the office of Dean of the Faculty of Medicine—in the remarkable expansion of the University which may be illustrated in the part I have taken in founding Lectureships on Ophthalmology, Diseases of the Throat and Ear, on Sick Children's Diseases, Tropical, Infectious, and Venereal Diseases, on the History of Medicine, on Physical Therapeutics, and on Practical Pharmacology, and the institution of diplomas in connection with several of them. Apart from the above lecturers, there are now

fifty-nine or sixty associated with the Faculty of Medicine, whereas none are recorded in the Calendar of 1878-79.

"Practical instruction has simultaneously extended, so that it even threatens to supersede instruction by lectures; but it should not be overlooked that a course of lectures is indispensable for the broad and academic conception of almost every subject, while for such lecture-courses large classes are not objectionable, but rather advantageous by stimulating both the teacher and the audience.

"Perhaps, above all, during the last twenty years there has been a recognition of the high academic and professional value of original research, and in all medical departments it is being seriously engaged in; whereas, at the time of my appointment, it was almost totally unprovided for, both in accommodation and equipment, and was regarded as an amateurish occupation or dissipation, which did not possess any educational value.

"In the Royal Infirmary—my other important sphere of official work—the expansions have also been great. They may be illustrated by the statement that there were no assistant physicians until 1869, when Dr. Muirhead was with me honoured by being the first appointed to this office: whereas there are now eight assistant physicians on constant duty; and that, while the first assistant physicians, besides their other duties, had charge of the fever patients, comprehending all the fever cases in Edinburgh, these patients are no longer received into the Infirmary, but are treated in a special city hospital.

"This long tenure has given me the opportunity likewise of engaging in several branches of research and observation in Medicine and Materia Medica. At the danger of being egotistical, I would venture to mention especially such work as that which led to the discovery in physostigma of the first substance found capable of contracting the pupil, now in everyday use by the ophthalmologist. It is interesting to recall that, when towards the end of the eighteenth century Bunge demonstrated to Goethe the pupil-dilating action of atropine, that poet-philosopher desiderated a pupil contractor, and hoped that it would be found in the course of time. I would also mention the revealing, in the strophanthus and acokanthera genera, of powerful agents for strengthening a feebly-acting heart and treating a large group of diseases of the circulation; of determining in pharmacological antagonism the power of a remedy to prevent death, and thus giving a required confidence to therapeutic practice; of proving that the bile is capable of rendering inert the most violent poisons, such as venoms and the deadly viruses of diphtheria and tetanus; and, to take only one other example, the discovery, with my friend Professor Crum Brown, that a change in the chemical constitution, apart from the composition, of an active substance may result in a profound change in action, whereby the key was provided for the opening up of a treasure-

house of therapeutic riches such as paraldehyde, sulphonal, trional, tetranol, and other pain-subduing and sleep-producing medicines; and of acetanilide, antipyrine, phenazonum, exalgine, and other reducers of high temperatures, and which suggested to Ehrlich the new pathological therapeutics recognised as chemo-therapy.

"To-day's proceedings have naturally led me to consider why I have been able so long to remain on duty. I attribute much to the congenial work on which I have been engaged. For it a most favourable stimulus was supplied from the first day of my admission into the Faculty of Medicine, as my colleagues consisted of Professors Hutton Balfour, Rutherford, Grainger Stewart, Turner, Crum Brown, Spence, Sanders, and Lister. It is a melancholy thought that only one of these colleagues survives in my professional-life friend, Professor Crum Brown. Accounting also for my long continuance in active work, I recognise a favourable hereditary predisposition. My parents and grandparents on both sides were long-lived and some of them enterprisingly hardy. There is a tradition, which recently was still alive in the Borders, that my paternal grandfather thought it no great feat to swim on horseback across the Tweed when that river was in full flood and it was considered foolhardy to do so.

"I would also be inclined to attribute much to the circumstance that several years after I had been much engaged in the exhausting work of original research, I received an appointment in Cheshire, where I rode much, even mildly following the hounds, and worked in the open air in my garden before the days of allotments. This break in the continuity of absorbing occupation was of the highest value to mental and physical well-being; and, as I have done before, I would again advocate that every professor whose duties occupy him both in the winter and summer sessions should be given relaxation for six or twelve months after eight or ten years of duty. Thus it probably was that, subsequently, during the first twelve years of my professorship, I was never once absent from any university or hospital engagement on account of illness. But in thus searching for the causes of a long-sustained fitness, I cannot omit one supreme agent, my wife, Lady Fraser, whose assistance and affectionate support have continued for more than forty-five years and have rendered possible almost everything I have been able to do.

"I must gratefully acknowledge that such work as I have accomplished, such duties as I have been able to undertake, have been recognised and rewarded even more than they merit.

"I have been given the honorary membership of many learned bodies in this country and abroad, and have been president of several societies. I have represented the University on the General Medical Council, and have been member of the University Court for ten years, and Dean of the Faculty of Medicine for twenty years. The appoint-

ment of Honorary Physician-in-Ordinary to the King in Scotland, admitting me to place in the Royal Household, is held by me; and after yesterday's graduation ceremony I have received honorary degrees from five of the universities of the United Kingdom and Ireland.

"Above all, I have met with the greatest consideration and kindness from individuals as well as from public bodies. My experience of life has shown me that, even from the most unexpected sources, 'the milk of human kindness' flows abundantly to those who are receptive and appreciative.

"The presentation I have to-day received much transcends any ambitions I may have entertained. It comes at a time laden with the most momentous events, and when a victorious peace has been gained by the defeat of the most arrogant and ruthless enemy of civilisation. Conspicuous events in any year have been used to distinguish products of that year. The 'Jubilee' gives a distinction to certain products of the vineyard, and 'Victory Loans' are to-day being issued.

"The picture you have made me the grateful recipient of may not inappropriately be designated, apart from its artistic merits, a 'Victory Portrait.'

"However that may be, Mr. Chairman and gentlemen, for the honour and kindness of the presentation, for the words that have been spoken by those who have addressed us, I myself and my family most heartily and sincerely thank you all."

Prof. Sir Robert Philip expressed the thanks of the subscribers to the artist for the care and skill he had bestowed on his work.

The Right Rev. Dr. Paterson, Moderator of the Church of Scotland, moved a vote of thanks to the Chairman, and remarked that if Sir Thomas had chosen a literary career, he would have been as successful in it as in medicine.

The late Robert Abernethy, M.D., F.R.C.P.

EDINBURGH mourns a great loss in the person of Robert Abernethy, who passed away at Bridge of Allan on 8th July, at the early age of 52.

Kindly and sympathetic in nature, a gentleman in the truest sense of the word, he will be sadly missed in many a home where he was a true and helpful friend as well as medical adviser. It is not too much to say that all the profession loved and respected Abernethy, and he possessed the confidence of all. One feels that one was the better for having counted him friend, and to his widow and daughters we offer the deepest sympathy in their bereavement.

Robert Abernethy was educated at the Edinburgh Academy and the Edinburgh University. Living in the house of his uncle, Dr. David Brackenridge, he came in contact with most of the leading medical men of the time, and was early imbued with the highest traditions and

instincts of the profession. His kindly disposition gained him many friends. All Academicals had a great regard for "Dick." He had a successful under-graduate career, and was in succession Resident Physician and Resident Surgeon in the Royal Infirmary. The confidence of his fellow-students was shown when they elected him one of the Presidents of the Royal Medical Society. He graduated M.D. in 1893, and was elected a Fellow of the Royal College of Physicians the same year. Starting practice in Edinburgh, he early succeeded to the nucleus of a practice from his uncle, which he developed till he became a very busy man. Anxious to be helpful in the war crisis, he took an active part in the work of the Medical Boards. Like many another, he was over-worked, and after the very trying autumn he fell a victim to influenza, which was followed by pleurisy in January. His progress was slow, but his friends were all thankful when he was pronounced well enough to go to Bridge of Allan for a change. Unfortunately, while there he had a serious relapse. He has given his strength for his country as loyally and unselfishly as any man on active service. F. D. B.

Appointments.

Dr. Francis D. Boyd, C.B., C.M.G., has been appointed Moncrieff-Arnot Professor of Clinical Medicine in the University of Edinburgh, in succession to Professor Russell, resigned.

Dr. J. C. Meakins, M'Gill University, Montreal, has been appointed to the newly constituted Chair of Therapeutics in the University of Edinburgh.

Sir Harold J. Stiles has been appointed Regius Professor of Clinical Surgery in the University of Edinburgh, in succession to Professor Francis M. Caird, resigned.

Dr. Douglas Mathewson, B.Sc., F.R.C.P.(Edin.), has been appointed an Assistant-Physician to the Royal Infirmary.

The following appointments have been made to the Honorary Staff of Leith Hospital:

Mr. Henry Wade, F.R.C.S.(Edin.), Surgeon; W. A. Pirie Watson, F.R.C.S.(Edin.), Assistant-Surgeon; Mr. W. W. Carlow, F.R.C.S.(Edin.), Assistant-Surgeon and Registrar; Dr. Arch. M. Stewart, Assistant Physician.

Scottish Board of Health.

The newly constituted Scottish Board of Health held its first meeting in Edinburgh on 18th July. The following are the members of the Board:

The Right Hon. Robert Munro, K.C., M.P., President; W. J. W. Pratt, M.P., Vice-President; Sir George M'Crae, D.S.O., Chairman; Miss Muriel Ritson; Sir James Leishman; Sir Leslie Mackenzie; Dr. M'Vail; and Mr. Ewan F. Macpherson, C.B.

University of Edinburgh.

THE Summer Graduation Ceremonial was held in the M'Ewan Hall on Thursday, 10th July 1919, the Vice-Chancellor, Sir Alfred Ewing, presiding.

The Honorary Degree of Doctor of Laws was conferred upon the following members of the medical profession :—Emeritus Professor Sir Thomas R. Fraser, M.D., F.R.S. ; Major-General Sir William Grant Macpherson, C.B., K.C.M.G., London ; Professor Rutherford Morison, F.R.C.S., Durham University ; Professor Diarmid Noel Paton, F.R.S., University of Glasgow ; Brig.-General Arthur E. Ross, C.B., C.M.G., Canada.

The Degree of Doctor of Medicine was conferred upon Arthur Cecil Alport, England, M.B., Ch.B., 1905 (Capt., R.A.M.C.) ; Robert George Archibald, D.S.O., India, M.B., Ch.B., 1902 (Major, R.A.M.C.) ; Robert George Bannerman (M.A.), Scotland, M.B., Ch.B. (with First Class Honours), 1914 ; Frederick Adolphus Fleming Barnardo, C.I.E. (M.A.), England, M.B., Ch.B., 1899 (Colonel, I.M.S.) ; Edwin Bramwell, England, M.B., C.M., 1896; Frederick Russell Brenner (M.A.), Scotland, M.B., C.M., 1903; Arthur William Treminheere Buist, Scotland, M.B., C.M., 1888 (Lt.-Col., I.M.S.) ; Duncan Macnab Callender (M.A.), Scotland, M.B., Ch.B., 1902 ; Disney Hubert Dusch Cran, Scotland, M.B., Ch.B. (with Second Class Honours), 1911 ; Gerald Fitzgerald, Scotland, M.B., C.M. (with First Class Honours), 1890 ; Walter Benjamin Harry, Wales, M.B., C.M., 1891 ; Kenneth Goodall Hearne, Australia, M.B., Ch.B., 1911 ; James Burnett Hogarth, England, M.B., Ch.B., 1914 ; Matthew James Johnston, Ireland, M.B., Ch.B., 1907 ; Robert Lawson, Scotland, M.B., Ch.B., 1915 ; Edward Loggie Middleton, Scotland, M.B., Ch.B. (with Second Class Honours), 1909 ; Ronald Roderick Murray, Scotland, M.B., Ch.B., 1905 ; William Henry Parkes, C.B.E., C.M.G., New Zealand, M.B., C.M., 1892 (Colonel, N.Z.M.C.) ; Dhanavada Samuel Ramachandra Rao (M.A.), India, M.B., Ch.B., 1905 ; Archibald Romanes (M.A.), Scotland, M.B., Ch.B., 1912 ; Alan William Stuart Sichel, (B.A.), South Africa, M.B., Ch.B. (with First Class Honours), 1912 ; Robert Scott Stevenson, Scotland, M.B., Ch.B., 1912 ; Samuel Henry Stewart, Ireland, M.B., Ch.B., 1915 (with Second Class Honours) ; Edmund Leigh White, England, M.B., Ch.B., 1914.

The Degree of Master of Surgery was conferred on James Methuen Graham, Scotland, M.B., Ch.B., 1904.

The Degrees of Bachelor of Medicine and Bachelor of Surgery were conferred on :—Henry Morris Anderson, Hong Kong ; Adam Armit, Scotland ; Alfred Badenoch, Scotland ; Harry Berelowitz, South Africa ; John James Rouse Binnie, Scotland ; Alice Bloomfield, Scotland (with First Class Honours) ; Charles George Booker, South Africa ; Peter Martin Brodie, Scotland (with Second Class Honours) ; Cecil Carron Brown, Scotland ; Robert M'Call Burnie, Scotland ; Leybourne Stanley Patrick Davidson, Scotland (with First Class Honours) ; Frederick John Deane, Ireland ; Arthur Armstrong Denham, England ; Robert Lightbody Galloway, Scotland ; Kurt Gillis, South Africa ; Morris Goldberg, South Africa (with Second Class Honours) ; Arthur Trevenning Harris, England ; Marjorie Harris, England ; Cecil Edith Lyster Hole, India ; Jiwanda Ram Katariya, India ; Marjorie Hamilton King, Scotland ; Raymond Leslie Langley, M.A., England (with First Class Honours) ; Robert Kho Seng Lim, Straits Settlements ; Harry Stephenson Lucraft, Australia (with First Class Honours) ; John Charles Macartney, Ireland ; James

M'Intyre, B.Sc., Scotland ; Ella Grace Florence MacKenzie, M.A. (Allahabad), India; Ronald Douglas Mackenzie, Scotland ; Robert Macnair, Scotland ; Mona Macnaughton, M.A., Scotland ; Elizabeth M'Vicker, Ireland ; Mabel Stevenson Martin, Scotland ; George Henry Hope Maxwell. Scotland (*in absentiâ*) ; Jacobus Hugo Meiring, South Africa ; Abraham Marais Moll, B.A. (Cape), South Africa ; John Oliver Murray, Scotland ; Arthur Vincent Treadwell Musto, South Africa ; Edward Paul O'Dowd, Ireland ; Aerath Narayanan Nanoo Panikker, India ; Clifford William Patterson, Tasmania ; John Redwood Payn, South Africa ; Howard Sidney Plowman, South Africa ; Eric Haldane Ponder, Scotland ; Mary Simpson (*née* Paterson) Poole, England ; William Gordon Robson, M.A., Scotland (with Second Class Honours) ; Beatrice Annie Sybil Russell, Scotland ; Richard Sandilands, B.Sc., Scotland ; Mahmoud Zaky Sheriff, Egypt ; Bertie Soutar Simpson, Scotland ; William Augustus Slack, St. Kitts ; Valentine Alexander Stookes, B.Sc. (St. And.), England ; Arthur Kinsey Towers, England ; Maung Sein Tun, B.A. (Calcutta), Burmah ; Petrus Cornelius Uÿs, South Africa ; Jakob Rudolph de Villiers, South Africa ; George Ronald Waller, South Africa ; Robert Boog Watson, Scotland ; Alfred George Norton Weatherhead, Scotland ; John Sinclair Westwater, Scotland ; James Leslie Wilson, Scotland ; Duncan Ferguson Yuille, Scotland.

The Diploma in Tropical Medicine and Hygiene was awarded to Bremner Alexander, M.B., Ch.B. (*in absentiâ*).

The following awards of Fellowships, Scholarships, Prizes, etc., in the Faculty of Medicine were made :—

Thesis Gold Medallist—James Methuen Graham, M.B., Ch.M. *The Chiene Medal in Surgery*—James Methuen Graham, M.B., Ch.M. *The Ettles Scholarship and Leslie Gold Medal*—Raymond Leslie Langley, M.A., M.B., Ch.B. *The Allan Fellowship in Clinical Medicine and Clinical Surgery*—Peter Martin Brodie, M.B., Ch.B. *The Beaney Prize in Anatomy and Surgery*—Raymond Leslie Langley, M.A., M.B., Ch.B *The Mouat Scholarship in the Practice of Physic*—Raymond Leslie Langley, M.A., M.B., Ch.B. *The Conan Doyle Prize* —Morris Goldberg, M.B., Ch.B. *The Annandale Gold Medal in Clinical Surgery*—Alice Bloomfield, M.B., Ch.B. *The Buchanan Scholarship in Gynecology*—Harry Stephenson Lucraft, M.B., Ch.B. *The James Scott Scholarship in Midwifery*—Alice Bloomfield, M.B., Ch.B. *The Scottish Association for Medical Education of Women Prize*—Alice Bloomfield, M.B., Ch.B. *The Dorothy Gilfillan Memorial Prize*—Alice Bloomfield, M.B., Ch.B. *The Pattison Prize in Clinical Surgery*—James Leslie Wilson, M.B., Ch.B. *The Cunningham Memorial Medal and Prize in Anatomy*—John Rough M'Donald. *The Crum Brown Medal in Chemistry*—Thomas R. Paterson.

Royal College of Surgeons of Edinburgh.

At a meeting of the College, held on 11th July, the following gentleman, having passed the requisite examinations, were admitted Fellows :—Joshua Isadore Baeza, M.B., Ch.B.(Edin.), Medical Officer, West African Medical Service, Barbadoes, British West Indies ; Robert Chalmers, M.B., Ch.B., M.D.(Aberd.), in charge English Presbyterian Mission Hospital, Swabue, Swatow, China ; James Erlank, M.B., Ch.B.(Edin.), Graaf-Reinet, Cape Colony ; Aubrey Scott

Gillett, M.R.C.S.(Eng.), L.R.C.P.(Lond.), London ; Eben Stuart Burt Hamilton, M.B., Ch.B.(Edin.), Capt. R.A.M.C. ; Maurice Bertram Lawrie, M.B., Ch.B.(Edin.), Capt. South African Medical Corps; George Millar, M.B., Ch.B.(Edin.), Temp. Capt. R.A.M.C., Resident Medical Officer, 2nd Scottish General Hospital ; Sengarapillai Ponniah, L.R.C.S.E. (Triple), L.M.(Dublin) ; Alan Thomas Roberts, M.B., Ch.M.(Sydney) ; George John Chase Smyth, M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.B., B.S.(Lond.), East London, South Africa ; Harvey Henry Vincent Welch, M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.B., B.S.(Lond.), Derby ; John Benson Young, M.B., Ch.B.(Edin.), Chepstow, Monmouthshire.

Triple Qualification Passes.

At the examinations of the Board of the Royal College of Physicians of Edinburgh, Royal College of Surgeons of Edinburgh, and Royal Faculty of Physicians and Surgeons of Glasgow, held at Edinburgh in July, the following candidates passed the *First Examination* :—J. J. Mann, R. F. Pagnan, T. G. S. Harkness, R. W. P. Hall, Jemima M. M'Kendrick, and John S. Caldwell.

The following passed the *Second Examination* :—L. E. Murray, W. W. Clucksman, P. E. Malloch, G. Krajewski, J. Kirkness, A. W. Buchan, J. L. Gibson, A. S. Irving, and E. J. Allan.

The following passed the *Third Examination* :—P. C. H. Homer, J. B. Dobson, W. R. Tattersall, F. J. D. Cass, W. F. G. Radford, E. F. Birkenstock, and J. G. Collee.

The following candidates, having passed the *Final Examination*, were admitted L.R.C.P.E., L.R.C.S.E., L.R.F.P. & S.G. :—John Stewart Marshall Connell, Glasgow ; Robert Berry Forgan, Edinburgh ; Poon Lip Loh, Singapore ; Thomas Lloyd Edwards, Carnarvon ; John Kohler Steel, Dundee ; John Fraser Kerr, Middlesboro' ; Shem Stein, South Africa ; Thomas Richard O'Keeffe, Cork ; William Gibb, Kirkcaldy ; Daniel Adrian Stegman, Sutherland, Cape Province ; Maurice Julius Woodberg, Glasgow ; and Jung Bahadur Singh, British Guiana.

THE TREATMENT OF ACUTE GONORRHŒA:

With Special Reference to Vaccine Therapy and the Value of Detoxicated Vaccines and the Complement Deviation Test in Acute and Chronic Cases.

By DAVID LEES, D.S.O., M.A., M.B., F.R.C.S.(Edin.),
Clinical Medical Officer in charge of Venereal Diseases,
Derbyshire County Council.

Since the discovery by Neisser in 1879 of the gonococcus as the causal organism of gonorrhœa, the treatment of this condition has undergone so many changes that a summary of the more important of these methods, and an appreciation of their relative merits as found in actual practice, may be interesting. As a killing disease, gonorrhœa ranks low; but as a cause of continued ill-health and disability it occupies, according to no less an authority than Osler, "a position of the first rank," and does not fall very far short of syphilis in importance.

The gonorrhœal patient, as we see him at civilian clinics and in military hospitals, seldom presents himself for treatment before the second or third day of his disease, and more often towards the end of the first week, and the same holds good in consulting practice. During this time he has either been hoping against hope that the discharge would clear up, or has been attempting to treat it in secret by many of the quack remedies on the market. Thus it is that the disease as seen by the clinician is generally beyond the stage when abortive treatment of any kind, either by concentrated injections or irrigation of potent antiseptics, by medicated bougies, or by the excellent sealed-in method of Ballenger[1] with argyrol, is of any avail. The discharge has become definitely purulent, and the gonococcus has proliferated in its human culture-tube and extended not only some distance along the urethral tract, but in many cases penetrated between the epithelial cells, and established itself in the sub-epithelial tissues, in the glands of Littré and the lacunæ of Morgagni. We have thus an established gonococcal urethritis to deal with—not a simple surface inflammation of the urethra, but lesions of deeper and much more complicated structures, both in the anterior and posterior urethra.

Although many of the forms of treatment to be discussed are

often used in combination, it is preferable to deal with them under separate headings, as follows:—

I. General Treatment,
II. Medicinal Treatment,
III. Local Treatment of the Urethra,
IV. Chemico-Therapy,
V. Serum and Vaccine Therapy,

and at a later stage indicate which combination of treatment I have found from practical experience most effective in the treatment of acute gonorrhœa.

General.

Rest.—All are agreed that rest in bed is of great value in the acute stages of the disease. This cannot always be attained, and we must aim at modified rest, and especially rest to the part affected, by the use of a proper suspensory bandage. This is of great importance. Most of those at present on the market support only the testes and press on the urethra at the peno-scrotal junction, and so stop efficient drainage. The penis should be kept in position by the bandage either along the inguinal fold or vertically upon the anterior abdominal wall, and this is most efficiently done by the type commonly used in America and sold commercially as "The Sport," or by a bandage after the fashion of "The Bergmann" used in Germany. A good suspensory bandage not only immobilises the organ but improves drainage by raising the peno-scrotal angle as high as possible, and ensures greater cleanliness. How important this drainage is, is seen in the frequency of inflammatory lesions and infiltrations found just behind the peno-scrotal angle on urethroscopic examination at later stages of the disease, and there is little doubt that these are due to accumulations of stagnant pus in that area. Sexual excitement should be avoided, the bowels well regulated, and all violent exercise forbidden, as any of these conditions tends to induce an extension of the infection from the anterior to the posterior urethra.

In the early stages the diet should be restricted. All meats, highly spiced and acid foods should be prohibited. Diluent drinks should be given in large quantities. As the condition becomes sub-acute the diet may be gradually increased, and in the later stages a full diet is permissible.

Certain French authors have advocated cutting down the amount of liquid consumed, with a view to allowing any antiseptic used locally to remain longer in contact with the infected mucous

membrane. I feel certain, however, that the increased mechanical washing out of the canal as a result of the intake of diluents is of more value than any limited action a residuum of antiseptic may have, and the intake of 20 to 25 glasses of water per day acts as a natural irrigator, and the only one that is not attended with danger.

Medicinal.

Internal medication dates as far back as 1462, when Gatinario advised the use of turpentine as a specific for gonorrhœa. Cantharides, introduced by Bartholin in 1465, then became the fashion. In 1674 Sylvius introduced copaiba, and in 1680 Sydenham, balsam of Peru. Since then almost every drug in the Pharmacopœia has been tried. Cubebs, sandalwood, and many others of this class, such as arrheol, pageol, gonosan, and santalmidy have in turn been put forward as specifics, but have rarely had any other effect than to produce gastric and renal disturbance. When one considers the small amount of these drugs which is excreted in the urine, it is not difficult to see how little effect they can have on the course of the infection. The only one which I have found of use is the yellow oil of sandalwood, and that only in the hyperacute case, where local treatment is, for the time being, contra-indicated. In such a case it will occasionally exert quite a beneficial action on the hyperacute process and lessen the profuse discharge, although it does not destroy the gonococcus. Vidal and Gougerot[2] give 1-gram capsules of Ol. Santal flav. five or six times a day for twenty days, then four times for five days, and gradually reduce the dose to 2 grams on the fortieth day, but their results are not impressive. In order to obtain the best effect, they state that the dosage must be large, and the patient should take as little fluid as possible, so that the drug may be present in the urine in a high concentration. I have tried all the balsam preparations, both alone and in combination with local treatment, and even when the dosage is pushed I have not seen any specific effect. Cases so treated invariably do not stand a rigid test of cure. Gastric disturbances are common, and, apart from the very acute cases above mentioned, I have seldom found these preparations of any use, and they are seldom required.

Urotropin alone, or in combination with acid sodium phosphate, has been widely used in gonorrhœa, both in France and America,[3] to prevent the onset of cystitis. My experience of it in this condition is that it is highly irritating to the urethral mucous membrane at the very time that one wishes to soothe this

structure, and especially so in the doses usually given of gr. x. t.i.d. The incidence of gonococcal cystitis is very rare, as the squamous epithelium of the bladder, like that of the vagina, is particularly resistant to this organism.

Urotropin is much more indicated in the later and more chronic stages when mixed infection is present either in the prostate or in the prostatic urethra, and prostatic massage as part of the treatment is likely to force into the bladder secondary organisms such as B. coli, which may set up a cystitis. So also in cases in which prolonged instrumentation, if not done with strict asepsis, may set up a similar condition, urotropin in small doses is of value in producing an acid urine.

Alkalies and alkaline diuretics have had more vogue in England in acute gonorrhœa. After treating a large number of cases with alkaline diuretics, my own experience is that they are very beneficial in the early acute stages when gonococci are numerous and the discharge is profuse and purulent. The combination which I have found most useful is:—

℞	Pot. bicarb. . . .	gr. xxv.
	Pot. cit.	gr. xxv.
	Tr. hyoscyami . . .	min. xv.
	Aq. ad	oz. 1.

Oz. 1 taken t.i.d. p.c.

This quickly alkalinises the urine and increases the amount of it excreted, and with definitely alkaline urine the gonococcal process lessens in severity, the pain on passing water diminishes, and the number of pus cells in the discharge decreases. I do not usually continue the administration of this mixture for more than six to seven days, by which time the process has considerably calmed down and the discharge become muco-purulent. Of itself it will not cure gonorrhœa, but it is of value in that (1) it dissolves the thick pus and assists greatly in drainage; (2) it increases the amount of urine which washes the mucosa mechanically with an alkaline fluid in which, as Thomson [4] pointed out, the gonococcus cannot live. Although I have used this alkaline diuretic in over 2000 cases during the first week or so, I have not yet had a case of gonococcal cystitis. It is often advantageous to add to this mixture pot. or sod. bromide in doses of xv. to xx. grains in cases where erections are troublesome. Subsequent to the first week I have found little if any advantage from internal administration of drugs in an uncomplicated case, except in those cases which I

have already mentioned, as a safeguard where instrumentation or prostatic massage is being carried out.

When we come to consider the complications of acute gonorrhœa, there are quite a number of drugs that are of considerable value.

(*a*) *Epididymitis.*—If the process is just beginning, one may be able to abort it by cold evaporating lotions or the application of an ice-bag; but in the larger number of cases the condition is well advanced when we see it, and hot applications are to be preferred. Lead and opium or 10 per cent. ichthyol in glycerine locally, and injection of electrargol into the epididymis, are most effective in soothing pain and encouraging rapid resolution. At the same time atropine suppositories gr. $\frac{1}{100}$, or a combination of atropine gr. $\frac{1}{100}$, morph. gr. $\frac{1}{4}$, should be used to prevent retro-peristalsis along the vas deferens and to relieve pain; while in the declining stages ung. hyd. co. or ung. hyd. ammon. or iodex are useful applications to prevent induration and thickening of the parts.

(*b*) *Prostatitis.*—In this complication I have found a suppository of antipyrin gr. xv. and op. gr. $\frac{1}{2}$ beneficial in the early acute stages, while later one may replace it by a suppository containing ichthyol min. 5 and op. gr. $\frac{1}{4}$, bellad. gr. $\frac{1}{2}$, which hastens the process of resolution.

(*c*) *Arthritis.*—Pot. iod. is the most generally useful drug in this condition. Salicylates seldom have any effect even in the very acute stages.

Local Treatment.

Almost every known antiseptic has been tried in different dilutions, and exaggerated claims made for one or other of the many preparations by its advocates. Of those in common use the best known are:—

(*a*) Permanganate of potash or zinc.
(*b*) Silver preparations — *e.g.*, protargol, argyrol, hegonon, albargin.
(*c*) Flavine compounds—*e.g.*, acriflavine and proflavine.
(*d*) Mercurial salts—*e.g.*, oxycyanide and perchloride.
(*e*) Picric acid and its derivatives.
(*f*) Astringents—*e.g.*, zinc alum and copper sulphate and zinc sulphocarbolate.

The first five groups are used for their bactericidal power, while the purely astringent group is used in the later stages to

stimulate healing and dry up the watery discharge which is so often the result of chemical irritation.

Permanganate of potash has long held the field as the most useful all-round antiseptic for urethral work. I would not go so far as to claim, like Luys and others of the French school, that it has a selective affinity for the gonococcus, and that it renders the urethra an unsuitable medium for it. It is well borne in strengths of 1/10,000 to 1/6000, it is toxic to the gonococcus, and in the majority of cases does not irritate the urethra if used in the above concentrations. It is slightly astringent, and this, I think, is not in its favour, as one is so apt to get a case drying up and yet have gonococci remaining present in the tissues. It has the additional drawback that if used too long or injudiciously strong it is apt to set up a chemical urethritis which is very difficult to cure. Within the last year or so I have used it rendered alkaline by the addition of sodium carbonate just before use. The respective strengths I have used of the combinations are pot. permang. 1/8000, sod. carb. 1/5000. This combination is soothing to the patient, and more effective in the treatment than any other irrigating fluid which I have used during the first eight to ten days. I was induced first to use an alkaline irrigation by Captain Thomson's discovery in 1918 that the gonococcus was soluble in alkalies, and the excellent results I have obtained in nearly all cases are fully confirmed by Dr. Stoker, who at Rochester Row has used this method in a large series of cases.

Silver Preparations.—Silver nitrate was first used by Ricord and later by Neisser, who introduced it into the premier place in gonorrhœal therapy. Since then an immense number of different organic silver preparations have been tried, the best known being protargol, argyrol, and albargin. They have been most strongly advocated by German writers and a few Americans, but I cannot advocate their use in the acute stages of gonorrhœa, where they are not so generally useful as permanganate. The greater number of them must be prepared with distilled water, many of them form an insoluble albuminate, while most are so astringent that they irritate and destroy the sensitive mucosa. I have found them more useful in the subacute and chronic gonorrhœas than in the acute established case. In the strengths at present favoured, few of them do not irritate, and their antiseptic and penetrating action is always, I feel, at the expense of the mucous membrane. They have the added objection that, with a few exceptions like albargin, they must be used cold, and this is not to be recommended with

any irrigation in an acute attack of gonorrhœa. In 1918 Koll[5] advocated the use of albargin made up, with gelatine and tragacanth for its base, in a semi-solid ointment 1 per cent. in strength, which melted at body temperature. It is put up in a syringe in a much more aseptic form than most medicated bougies. He claims that it is unirritating, easy of application, and cleanly, and that the semi-solid remains longer *in situ*. It has, however, the objection that it is too astringent, and it does not penetrate the tissues any better than it does in the liquid form.

Flavine Compounds.—During the past year these compounds have been used extensively, and by some to the exclusion of all other antiseptics. Acriflavine in strengths of 1/4000 to 1/1000 is said to be well borne by the urethra and to be toxic to the gonococcus. Its chief advocates have been Watson[6] in Glasgow and Davies[7] in London. It has been tried extensively at Rochester Row, and found not to be in any respect the superior of pot. permanganate. I have seen in one hospital a large number of chronic cases which were treated exclusively from the beginning with acriflavine by one of its advocates in the above strengths, and was very much impressed, when one considered the length of time they had been treated, with the amount of gonococcal and mixed infection still present in these cases. Many of them also suffered from chemical urethritis. Subsequent to this I had the opportunity of testing a series of parallel cases with alkaline pot. permanganate and acriflavine, and the results with the former were, if anything, slightly better. Howarth had the same results in a series of cases in Glasgow. It is no doubt a valuable antiseptic in the early abortive stage, within twelve to twenty-four hours of the appearance of symptoms; but this is exactly the condition in which silver salts are pre-eminently useful, and its claims to be specific for the gonococcus and to penetrating power are not by any means established. It is in my experience not so generally well borne as pot. permanganate in all cases, and it certainly does not eradicate the gonococcus from the sub-epithelial tissues, while the price of it is prohibitive where large numbers have to be dealt with.

Mercurial Salts.—Oxycyanide, perchloride, and biniodide should not be used in the acute florid stage, but are extremely useful in combating mixed infection in the later stages. Both perchloride and biniodide, even in strengths as weak as 1/20,000, are irritating to the urethra in many cases. Oxycyanide in a strength of 1/4000 is not irritating, and is the most effective

solution I have used for irrigation to prevent or deal with mixed infection, and is especially useful after prostatic massage. They should be used only in the later or subacute stages of the disease.

Picric Acid.—I have found this solution useful as a change from permanganate in any case where the patient is not progressing, and also in cases where mixed infection is present. It must not be used in any concentration greater than ½ to 1 per cent. aqueous. Although it is apt to cause a little irritation, it is perhaps the most penetrating of all antiseptics, and as such is very valuable in infiltrations and in some of the more chronic conditions we meet with. Within the past year an attempt has been made by Lacombe[8] to overcome the failing of all antiseptics in penetrating power by evolving sulphurous anhydride gas within the urethra, as follows:—Two solutions are used, the first containing,

Hyposulphite of soda, grm. 17 in 1000 c.c. of water;

the second,

Picric acid, grm. 6 in 1000 c.c. of water.

Each is heated to 37° C., and 5 c.c. of a mixture containing 1 part of sod. hyposulphite and 4 parts of picric acid is injected into the urethra. Sulphurous anhydride gas and sod. picrate are formed. The gas exerts pressure on the urethral walls and penetrates into the lacunæ and gland follicles. Three injections in twenty-four hours in the early stages, and one in the later, are said to give promising results in the 130 reported cases. I have not yet tried this method, but it cannot be less effective than most of the antiseptic therapy in urethritis.

Astringents.—The purely astringent salts of zinc alum and copper are only of use in the latest stages of the disease, and exert little or no antiseptic effect. They are used solely to clear up the watery discharge which is due to the sodden, unhealthy mucosa, and which does not show gonococci. Zinc sulphocarbolate I find perhaps the best of them.

I have not found any antiseptic so far in urethral work which is more generally useful than permanganate, either of potash or of zinc, and alkalinity enhances its action in the early stages. It must be used in weak dilutions, more especially in the early stages, when the mucosa is inflamed and tender and liable to be desquamated by any strong preparation. It is not indicated, except in very exceptional cases, in strengths greater than 1/4000, and when the urethral process gets to that stage when a great many

feel that strong solutions are required to stimulate the mucosa and induce an outflow of serum, much more is to be gained, I think, by increasing the temperature of the solution used than by increasing the strength.

Once we are satisfied from microscopic examination that secondary organisms are present, then I have found hyd. oxycyanide the best preparation to use; and in the last stages, when only a slight watery discharge is seen, zinc sulphocarbolate has the advantage of being not too strongly astringent, and at the same time stimulating to the unhealthy mucous membrane.

In the past, local treatment in the form of irrigation has been very much abused and overdone. From many cases coming under my observation, a few crystals of pot. permang., a syringe, and perhaps a few capsules of ol. santal. flav. constitute the sole armamentarium of many physicians. Rarely is the diagnosis verified at any stage of the disease by microscopy. I attach great importance to this, as the permanganate solutions are not nearly so germicidal to secondary organisms as is oxycyanide of mercury or dichloramine T. More rarely still is the patient instructed how to use the apparatus given him, with the result that (1) he uses more force than is necessary, and so spreads the infection further in and sets up complications such as epididymitis, vesiculitis, and prostatitis; (2) he does not practise asepsis and causes mixed infection. Personally, I have found it easier and safer to teach the patient how to manipulate the syphon douche with a Janet's nozzle rather than the syringe, and if one cannot carry out the injection or irrigation oneself, or have it done by a skilled orderly, this is the easiest and least dangerous method for the patient. I am hopeful that in the future, with improvement in other forms of treatment, we shall be able to eliminate almost all local treatment, and so avoid the many dangers to which it exposes the patient. Up to now there is no antiseptic or combination of them which will fulfil the three conditions one must lay down for the efficient treatment of urethritis by local treatment only, viz.:—

(1) Non-irritating to the tissues.
(2) Toxic to the gonococcus.
(3) Penetrating to living tissues.

An alkaline solution of pot. permang. more nearly approaches this standard than any other antiseptic which I have tried, and should always be preferred in the acuter stages of the disease.

Strongly astringent and cauterising salts are most to be avoided, as the result so often is a condition of chemical urethritis from which many cases suffer for months after the infection has been cleared up, and many of these cases, I am afraid, are those which later on fill our out-patient departments with patients suffering from stricture.

Congestive Treatment by Biers' Method.—This was recommended by Miles,[9] who reported a series of 300 cases successfully treated by this method. The almost complete absence of complications was remarkable. Pain disappeared quickly, and discharge also. There is no doubt that the results obtained were due to a large extent to the fact that by passive hyperæmia he caused an outflow of serum into the urethral canal, with the result that the anti-body of the blood-serum was brought more closely in contact with the focus of disease and exercised its good effect on it by means of its precipitins, agglutinins, bacteriolysins, etc. At the same time the exudate loosens and separates the tissues, thus aiding the passage of leucocytes in their protective work, while the deposit of fibrin formed in all inflammatory exudates tends to localise the infecting process. This method has a great deal to recommend it in its simplicity and cleanliness, and, if used in combination with a good antigenic vaccine to raise the anti-body output, would, I am sure, be still more effective, and is well worth an extensive trial.

Chemico-Therapy.

Mercury.—The first chemical substance tried in gonorrhœa by intra-muscular injection was mercury, due to the observed fact that many syphilitics who had a concomitant gonorrhœa ceased having a purulent discharge when intra-muscular injections of mercury were given.

Succinamide of mercury has been extensively tried in doses of 50 mg. every third or fourth day intra-muscularly. Three to four doses were administered, and the course, if necessary, repeated after a week's interval. Some of the cases cleared up remarkably quickly, but a great number were not affected, while others which became subacute or quiescent seemed to be much more difficult to treat after the administration of mercury salts. The injection in many cases is not without pain. Phthalmide of mercury, which contains in addition antipyrin, has also been tried, but is much too painful. Benzoate, bibromurate, and salicyl arsenate (enesol) are not so painful, but all are very irregular in their action,

some cases doing well and others badly. I gave these mercury preparations an extensive trial in over 250 cases, and found bibromurate of mercury or benzoate the least painful. All of them, although they lessen the discharge, in some cases almost miraculously, are apt to be followed by relapses if the case is put to any test of cure, and the cases so relapsing are more difficult to cure than an ordinary routine-treated case. Complications are not infrequent. The leucocytosis set up by the drug is no doubt the cause of the temporary cessation of the activity of the gonococcus, which is not destroyed, and flares up as soon as the treatment is stopped.

Harrison [10] has collected statistics in over 7000 cases so treated, and the incidence in hospital, when a definite standard of cure is laid down, is longer than that of ordinary routine methods. They promise most success in the early acute case. In the later stages they are valueless.

Manganese.—During the last two years manganese was introduced into the treatment of gonorrhœa. Collosol manganese was administered by intra-muscular injection in doses varying from 0·5 to 2·5 c.c. at intervals of two to three days by Macdonagh,[11] and claimed to be specific for the gonococcus. The results from collosol manganese claimed by him were so promising that it was tried extensively in six different hospitals. Parallel series of cases treated by ordinary irrigation treatment were at the same time compared. In none of the six hospitals was it found to be any more effective than ordinary routine irrigation treatment, while several clinicians reported that the cases were much more difficult to treat by any other method after manganese had been tried and failed. Complications were common, and in no case could any specific action either on the gonococcus or the staphylococcus be claimed. It exhibits the same peculiarities as mercury, but there is not so much pain after its administration. After the first dose the discharge may lessen, but it does not disappear altogether. Subsequent doses have much less effect, and the cure is never absolute. In a series of cases which I compared with cases treated by ordinary pot. permang. irrigation the incidence in hospital was decidedly less in the permanganate series. A provocative vaccine as a test of cure almost invariably caused the collosol cases to relapse.

Colloidal Palladium.—My experience with pallamine alone and with pallamine combined with manganese at a later stage has been exactly similar. I tested two parallel series: (*a*) twenty-

five treated by two intra-muscular injections of pallamine ·5, followed by two to three of manganese ·5 and 1 c.c. with concomitant irrigation of pot. permang. 1/10,000, followed later by zinc sulphate and internal administration of pot. nit. as suggested by Macdonagh [12]; (*b*) twenty-five cases on alkaline irrigation of pot. permang. plus alkaline diuretics for seven days, followed by oxycyanide of mercury irrigation. The results were greatly in favour of the latter series, both as to rapidity of disappearance of the gonococci and as to time taken for absolute cure.

Serum and Vaccine Therapy.

Serum therapy is the production of passive immunity by the introduction into the patient's body of the serum of an animal that has been actively immunised by vaccination. I have tried antigonococcal serum, but not with any success, except in one or two isolated cases where there was a very hyperacute toxæmia, as is seen in some of the epididymis cases. In ordinary gonorrhœa it is not effective, and, on account of this, authorities like Asch [13] have altogether discarded its use. With regard to the other sera —*e.g.* antimeningococcus and antidiphtheritic,—in gonorrhœa their use always seems to me to be absolutely unscientific. Such substances can only act as a foreign protein, and so cause a general upset and produce a phenomenon somewhat allied to the anaphylactic state in which the body may be for a time immune to pyogenic organisms. Gonorrhœa cannot be cured by non-specific antisera any more than pneumonia or typhoid can.

Phylacogens.—These substances, containing as they do the products of a multiplicity of pyogenic organisms, are very irregular in their action, and one cannot estimate the dosage of their different components accurately enough. As a result of this, reactions are often very violent, and it does not seem to me sound therapy to administer a phylacogen containing, say, staphylococci or pneumococci when none of these organisms are present in the urethral infection, and so put a strain on the anti-body producing power of the tissues to provide something not required. Both sera and phylacogens were given an extensive trial by Harrison at Rochester Row, and the results were not promising.

Vaccine Therapy.—Active immunisation of the patient by vaccines has been extensively tried. By an appropriate vaccine we can stimulate in the tissues the production of anti-substances to any definite infecting organism. In 1898 Wright proved that

anti-bodies to an organism may be produced by inoculating a person with similar dead micro-organisms. He was the first to realise that any bacterium causing localised disease and capable of isolation in pure culture could be employed in the form of a suspension to cure that disease. In 1902 Bordet and Gengou discovered the principle of the complement fixation reaction, and Mueller and Oppenheim[14] in Austria published the first results on it in relation to gonorrhœa in 1906, and showed that we had in it the means of estimating the amount of anti-substance which was present in the blood-serum of persons infected with gonorrhœa. The technique of this test is now so much improved that Thomson within the last year has at Rochester Row been able to get positive results in the first week or so of the discharge, so that in the future it is almost certain to become of great value in the diagnosis of obscure cases, especially in the female. Later I will show also how it is of great value in prognosis, in regulating treatment, and in the final diagnosis of cure and fitness to marry.

In gonorrhœa, we know from the chronicity of many cases, and from the fact that only a comparative immunity exists after an attack, and that for a very short period, that anti-substance is not produced quickly or in any quantity by nature. In the ordinary run of cases one finds that the amount of anti-substance produced is just sufficient to combat the virulence of the organism and no more, with the result that the process often develops into a sub-acute one, and later into a chronic condition in which neither the invading organism nor the anti-body produced by it gains the upper hand. It is in the rapid production of this anti-substance in the early stages, and in the stimulus to its extra production in later stages, that vaccines are useful as an adjunct to the ordinary treatment of gonorrhœa. For a vaccine to be effective in any disease it must be (*a*) specific, (*b*) of good antigenic power. The first is obtained by accurately determining the nature of the causal organism, so that we may have produced the anti-bacterial bodies to that organism in the shape of lysins, precipitins, agglutinins, etc. The second is obtained (*a*) by using many strains of the same organism, *i.e.* a polyvalent vaccine; (*b*) by using only young, virile strains of twenty-four to forty-eight hours cultures and not sub-cultures; (*c*) by avoiding the use of heat in the preparation of the vaccine.

To the observation of these methods was due largely the success of the polyvalent gonococcal vaccine made at Rochester Row by Captain Thomson, when the results from its use were

compared with those of other commercial vaccines. Even with vaccines so prepared, many clinicians were not always successful in actively immunising their patients. Those who were most successful obtained their results by giving what many considered excessive doses. Brett [15] started with 200 millions, and forty-eight hours later gave 1000 millions, repeating the dose forty-eight hours later if necessary. His reactions were excessive, but his results were certainly good in thirty-three cases whose stay in hospital was 13½ days. On account of the toxic nature of gonococcal vaccine, most workers in this country preferred to begin with small doses, say 5 to 25 millions, and to work gradually up to 100 or 150 millions. In America much higher doses were favoured, 50 to 500 millions being given. This toxicity has long been recognised as one of the drawbacks to vaccine therapy in gonorrhœa, and attempts have been made successively by Besredka [16] in 1912, Nicolle and Blaizot [17] in 1913, and Howarth [18] in 1918 to reduce it. Besredka and Howarth sensitised the vaccine so that doses up to 1200 millions could be given without producing too great a reaction, while Nicolle and Blaizot grew the gonococcus on a special medium and produced a vaccine known as Dmégon, put up in sodium fluoride. The results obtained by these and other workers who used their vaccines were consistently good.

In 1915 Major Dawson and Captain M'Whirter, working at No. 9 Stationary Hospital, produced a vaccine known as Staphgon, containing 150 million staphylococci and 50 million gonococci in each c.c., prepared much in the same way as Dmégon by Nicolle and Blaizot, and the results obtained with it in several thousand cases were remarkably good. Lumb [19] has published statistics of 500 cases treated with this vaccine, and remarks on the mild course of all cases so treated, the absence of complications, and the very small number of relapses. I was able to compare 200 parallel cases treated with this vaccine with a similar number treated with mercurial injections, and the results were greatly in favour of the vaccine. The doses used were ¼ c.c. rising to 2 c.c. in twenty-one days, or a total of 350 million gonococci and 1050 million staphylococci. Even these doses at times proved toxic, and the reactions were so great that subsequent doses could not be increased. Lumb states that by giving successive doses every fourth day he was able to superimpose one positive phase upon another. Theoretically this may be correct, but in practice I found that different individuals react differently to the same

dosage both in time and amount, and each case had to be treated as a separate entity and the dosage regulated according to the reactions.

Detoxicated Vaccine.—Although my results with gonococcal vaccine sensitised or otherwise prepared had promised well, I always felt that our dosage was not large enough to produce a large amount of immunity, and that the gonococcus was too toxic to give in any larger doses in the vaccines then at our disposal. By chemical analysis of the organism, and after some very careful research, Captain Thomson [20] discovered that the toxic element of the germ could be separated from the non-toxic element without in any way reducing the potency of the vaccine as a specific antigen. Much larger doses were thus possible, and resulted in much greater immunising power. His vaccine, now known as detoxicated vaccine, consists of the stroma of the germ minus its toxin, and can be given in doses containing from 1000 to 10,000 million gonococci. Experimentally he was able to demonstrate the production of anti-bodies to the gonococcus in the sera of three non-infected persons after intra-muscular administration of his vaccine, while ordinary polyvalent vaccine of the same strains had previously failed to make any change in the blood-serum, even when given in toxic doses, which produced large and prolonged reactions. If he could thus immunise a non-infected person, it would be much easier, he concluded, to increase the same immunity in an infected person whose tissues are already manufacturing anti-bodies to the germ, and in actual cases treated later with this vaccine this proved to be so. Aggravated cases of all types of acute gonorrhœa and its complications have been treated by me with it, and the results of the first series have been published with full details.[21] Since then I have continued to use it in cases of gonorrhœa in the male and female, and I have been able to rapidly produce and to demonstrate the presence of anti-body in their blood, and to record its gradual increase by the complement fixation test during the course of treatment, and its gradual decrease on ceasing to administer the vaccine subsequent to the disappearance of the clinical symptoms. The initial dosage I have used has been 2500 millions in the male and 1500 millions in the female, and these doses produce less reaction than 50 millions of ordinary polyvalent vaccine. To begin with, I administered the vaccine in solution into the muscles of the buttock, but latterly I have used it subcutaneously in the form of a precipitate; and although the local reaction is more marked by the latter method, I am inclined to think that its action is

more rapid, and it is certainly more prolonged. Very rarely is there a temperature reaction of more than 1 to 1·5 degrees Fahr.; this rarely lasts more than twelve hours, and the focal reaction seen after the first dose or two rapidly disappears with successive doses. The interval between doses is important, and although one cannot fix a definite period for all cases, I have found from observation of the blood-serum of patients on successive days that the output of anti-bodies subsequent to the administration of the vaccine is usually highest about the third or fourth day. This maximum point is the moment at which the succeeding dose should be given in order to superimpose one positive phase upon another. It differs slightly in certain patients, and each must be studied as a separate entity, and doses given according to the indications as evidenced by increase of temperature, local pain and redness, and increase or otherwise of clinical symptoms. The maximum single dose which I have given is 10,000 millions, and reactions with it are not excessive. I have administered as much as 90,000 millions *in toto* to a particularly resistant joint case of six years' standing, and cleared up his condition, and 87,500 millions to a case of severe sciatica due to a lesion of the prostate and seminal vesicles which had resisted treatment for seven years. I have found it alike valuable in the treatment of the early case and of the acute complications of the disease, such as epididymitis and prostatitis in the male, and cervicitis and salpingitis in the female. In chronic lesions of the prostate and seminal vesicles and in joint lesions, where local treatment is so hopeless, it is the most effective method I have yet tried, and, as far as I can see, the only one which can possibly reach the diseased focus with any certainty. From observation of over 200 cases now treated I have found the following course the most effective, and one which does not cause any violent reactions:—

1st day	2,500	millions.
4th „	„	„
8th „	5,000	„
12th „	„	„
16th „	7,500	„
20th „	„	„
25th „	10,000	„

making a total of 40,000 million gonococci in twenty-five days. In a great many of the early cases this amount is not necessary, and the clinical symptoms often clear up as early as the fourth

to fourteenth day. It is particularly noticeable that, the earlier the case is seen and the sooner the vaccine given, the less is the permanent damage done to the urethra by the gonococcus; and to this I attribute the almost entire absence of complications in the whole series of cases I have treated with detoxicated vaccine. In practically every case I have had the advantage of having the blood-serum of my patients tested at weekly intervals by Dr. Thomson to estimate the amount of anti-body present, and in only one has there been little or no response serologically to the injection of the vaccine. In this case the leucocyte count was found to be low, and two or three injections of acid nucleicum gr. $\frac{3}{4}$ were followed by an increase in the leucocyte count, and subsequent injections of vaccine proved effective in obtaining an immunity response. As tested by the complement deviation test, the average amount of resistance in cases as we see them when first coming for treatment is from 1 to 2 units, and rather more in complicated cases such as epididymitis and arthritis. The average amount present in a patient's blood at the end of a course of detoxicated vaccine is found to be 8·5 units in urethritis, while in lesions of the epididymis, prostate, and joints it often reaches as high as 11 or 12 units. In treatment without vaccine the amount is found to rise only to an average of 3 units, while with the administration of an ordinary vaccine it will rise to an average of 4 to 5 units, according to the dosage given.

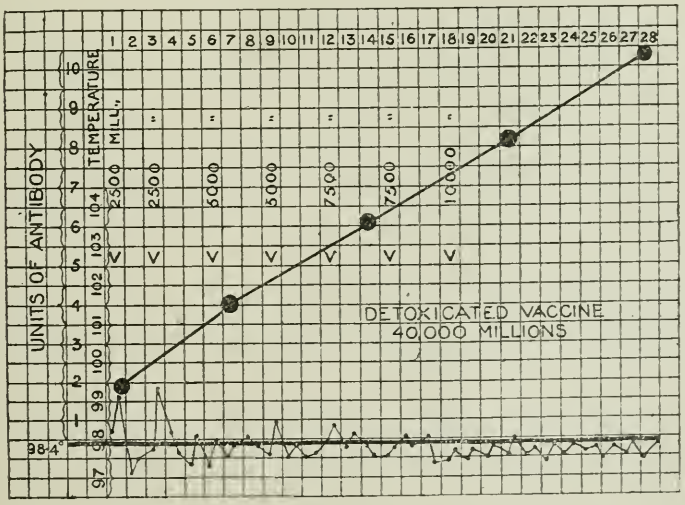


Chart 1.

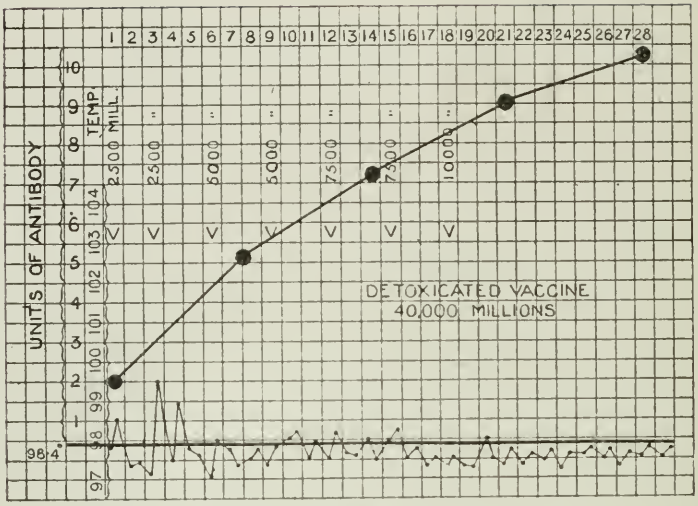
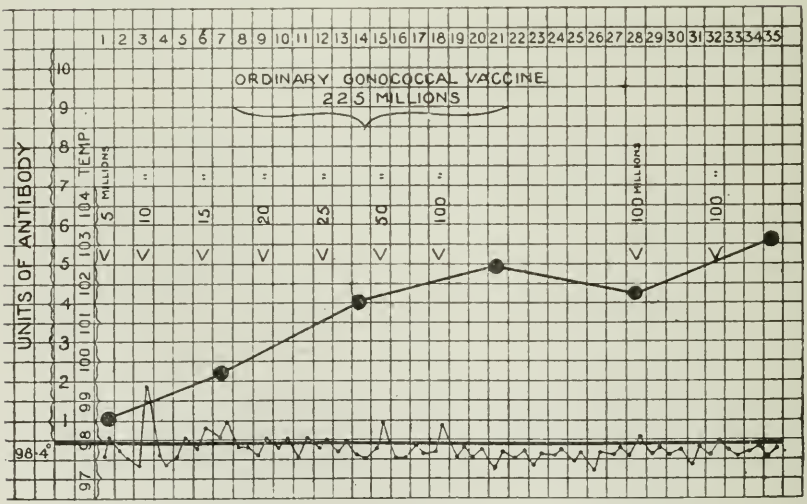


Chart 2.



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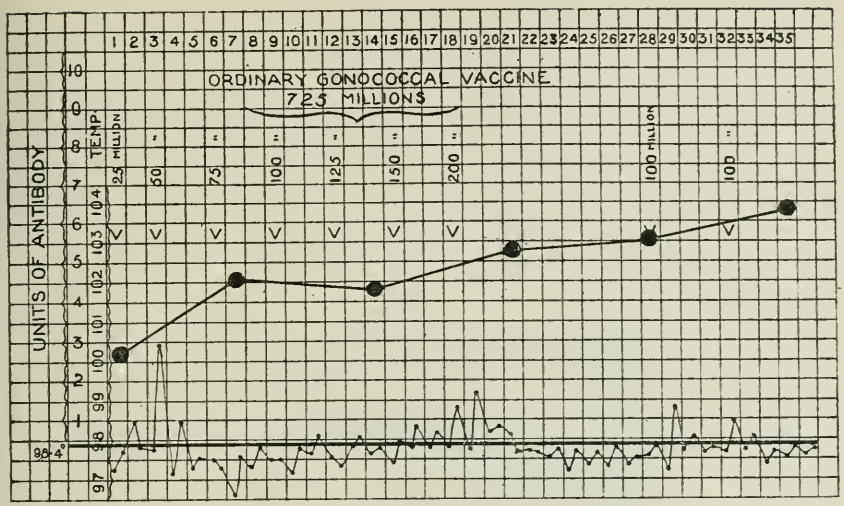

Chart 4.

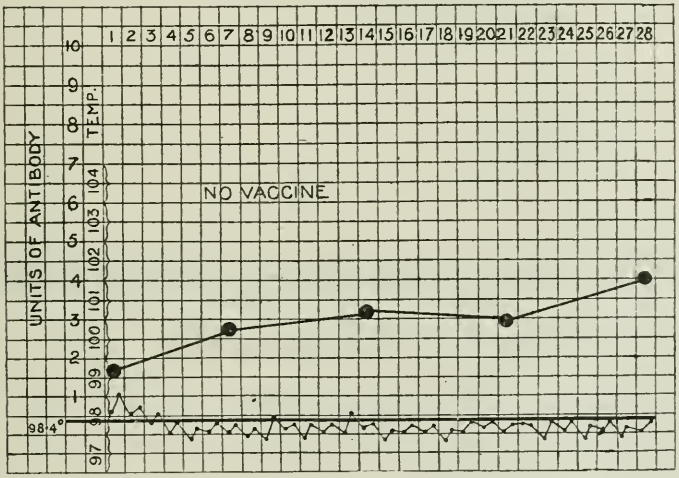

Chart 5.

The above charts show graphically the temperature reactions and the difference in the immunity response of cases treated simultaneously: (1) and (2) with detoxicated vaccine; (3) with ordinary polyvalent vaccine; (4) with ordinary polyvalent vaccine, but in larger doses; and (5) with no vaccine. All were cases of acute urethritis involving both anterior and posterior urethra. In Case 1 the discharge disappeared on the 14th day, in Case 2 on the 16th, in Case 3 on the 35th, in Case 4 on the 29th, in

Case 5 on the 42nd day. All cases were kept in hospital for twelve days subsequent to the disappearance of the symptoms and tested rigidly by pathological methods for pus and gonococci, and the detoxicated cases were followed up for a period of three months and showed no further sign of disease. Chart 6 shows the average time in which gonococci disappeared from urethral and prostatic smears in four parallel series of cases, and Chart 7 the average time in which discharge and all other symptoms cleared up in the same parallel cases.

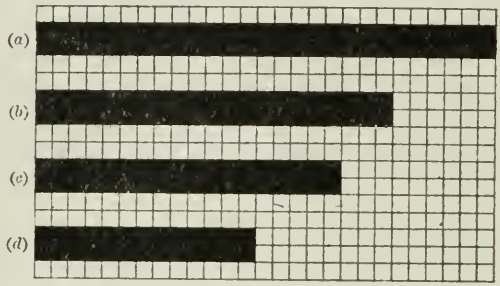

CHART 6.—Disappearance of Pus and Gonococci.

(*a*) No vaccine. 27 days.
(*b*) 225 millions ordinary polyvalent vaccine. 21 days.
(*c*) 725 millions ,, ,, 18 days.
(*d*) 40,000 millions detoxicated gonococcal vaccine. 13 days.

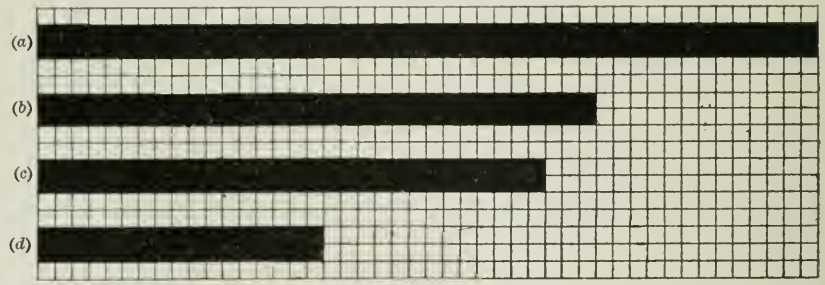

CHART 7.—Disappearance of all Symptoms.

(*a*) No vaccine. 46 days.
(*b*) 225 millions ordinary polyvalent vaccine. 33 days.
(*c*) 725 millions ,, ,, 30 days.
(*d*) 40,000 millions detoxicated gonococcal vaccine. 17 days.

The general treatment which I have given to all these cases has been restricted diet, comparative rest, the wearing of a well-fitting suspensory bandage, and internal administration of the

alkaline diuretic mixture above mentioned during the first seven days. Local treatment has consisted of urethro-vesical irrigation twice daily with 1/8000 pot. permanganate, lessened to once daily with the cessation of acute symptoms, and altered to 1/4000 sulphocarbolate of zinc on alternate days as soon as gonococci had disappeared from the urethral smears. These irrigations were used mainly for cleanliness and to establish drainage, and were given at a temperature of 104° F. in the early stages, and increased to 110° F. in the later stages, the object being to encourage the flow of serum to the affected part during the later stages of the infection. Vaccine therapy cannot possibly be effective in many cases of chronic gonorrhœa—*e.g.* those with closed-in pus follicles in a hard, fibrous prostate, or with a closed-in pus sac in a littritis or epididymitis—unless we first of all take steps to enable the circulating anti-body to reach the focus of infection. On this account we cannot dispense with the urethroscope, the bougie, prostatic massage, and many other forms of treatment, which are still necessary in subacute, chronic, and latent gonorrhœa. Urethroscopic examination and pathological examination of the prostatic secretion are indispensable in the diagnosis of subacute and chronic cases; but the active immunisation of the patient is the only thing that in the end will ensure complete cure. Pathological examination of the secretion is in addition necessary, as only by this can we ensure specificity in the vaccine. Many of the subacute and chronic conditions are due not to the gonococcus alone, but to secondary organisms such as staphylococci and B. coli, diphtheroids, etc.; and to effectively treat them it is necessary to administer in addition to gonococcal vaccine a detoxicated vaccine of the secondary organisms present. In this connection one of my cases under treatment for gonorrhœa had cleared up completely by the fifteenth day, and his unit of resistance was 8 plus. While being detained in hospital for twelve subsequent days to test his cure, he developed an acute attack of influenza, and a urethral discharge appeared which, on microscopic examination, proved to be Pfeiffer's bacillus, and a pure culture of this was grown. Detoxicated influenzal vaccine containing this germ was given, and the urethral discharge ceased in three days without any local treatment. This patient was kept in touch with for three months and remained well. It shows, as do many others, how essential it is that clinician and pathologist work together in treating disease, and how important it is that a vaccine should be a specific one.

"Try a vaccine," is so often the cry of the clinician in a case which resists all other forms of treatment, and any stock vaccine, whether specific or not, is administered more or less promiscuously. Professor Boyd [22] of Manitoba put the position admirably when he stated: "Merely to inject a vaccine once a week or so is in many cases to fall far short of one's duty to the patient, and certainly is not giving the method a fair trial. Vaccine therapy is not a sort of magician's wand by which we can exorcise every variety of disease." If used scientifically, it is one of the most effective means we have of attacking gonococcal infection, and in conjunction with other well-tried methods detoxicated vaccine, as prepared by Thomson, gives us the means of rapidly raising the patient's resistance.

Standard of Cure.—Various authors have put forward claims to rapidity of cure for their methods, but the standard of cure demanded has not always been a high one. In the cases on which I have used detoxicated vaccine as part of the treatment, every case was detained in hospital for twelve days subsequent to the disappearance of clinical symptoms; morning urine and morning smears were examined on successive days; a provocative irrigation of mag. chlor. 1/500, or a provocative injection of ordinary vaccine 100 millions, was given during this period. Prostatic massage was carried out and subsequent examination of the prostatic secretions, and in every case the results were negative to pus and gonococci. In the more chronic cases urethroscopy was done as a routine. In spite of this rigid standard, none of the cases relapsed, and they have been kept in touch with and reported subsequently for two or three months for serological tests. These serological tests, done subsequent to cure, have proved interesting, and are of great value in estimating how long anti-bodies to the gonococcus remain in the blood, and enable us to establish an absolute standard of cure and a standard of fitness to marry. In my own blood, anti-body artificially produced by the injection of 7500 millions of detoxicated vaccine remained present for four and a half months. In the majority of infected patients it remains present for from four and a half to five and a half months. If we can establish this, the definition of absolute cure becomes a practical one, and any case which six months after cessation of treatment gives a negative blood test can be passed as fit to marry. This will in the future prove of great help in preventing many of the innocent infections which occur after marriage, and will be of incalculable value in female cases, where the question of cure is so difficult to establish. From

observation of vaccine-treated cases during the last four years, and of detoxicated vaccine treatment during the last twelve months, I have come to the following conclusions :—

1. It is possible to produce a rapid immunity response in patients suffering alike from acute, sub-acute, and chronic gonorrhœa with a specific detoxicated vaccine.

2. Reactions with detoxicated vaccine are rarely severe, and the condition of negative phase is not produced by their administration in the doses I have used.

3. Detoxicated vaccine is the only form of vaccine which can be given safely in such large doses as will provoke a rapid and continuous output of anti-body substance by the tissues.

4. Chemical compounds and non-specific sera do not increase the production of specific anti-body to pathogenic organisms.

5. The complement fixation test in gonorrhœa provides us with a valuable aid to diagnosis, a guide to the effect of treatment, and six months later a serological test of cure.

6. Increase of anti-body in the blood in gonorrhœa coincides in all cases with disappearance of clinical symptoms. Nature produces it slowly; detoxicated vaccine produces it quickly, and so ensures rapid recovery and prevents destruction of the tissues and subsequent complications.

I am deeply grateful to Colonel Harrison for his valuable advice and guidance in this work, and to Captain Thomson for the large number of serological tests which he has carried out for me, on the results of which this paper is largely based.

References.—[1] Harrison, *Trans. Lond. Med. Soc.*, 3rd February 1919. [2] Gougerot, *Journal des Pratiques*, 1st June 1918. [3] Amer. Army Adv. Com., *Journ. Amer. Med. Assoc.*, 1917, ii. 1169, 1259. [4] Thomson, "Autolysis of the Gonococcus," *Brit. Med. Journ.*, 1917, i. 869. [5] Koll, *Diseases of the Male Urethra.* [6] Watson, "The Treatment of Gonorrhœa with Acriflavine," *Brit. Med. Journ.*, 10th May 1919. [7] Davies and Harrell, *Brit. Med. Journ.*, 22nd March 1919. [8] Lacombe, *Journal des Pratiques*, 1st June 1918. [9] Miles, *Trans. Edin. Med.-Chirurg. Soc.*, 4th May 1910. [10] Harrison, *Lancet* (*Trans. Roy. Med. Soc.*), 8th February 1919. [11] Macdonagh, *Practitioner*, May 1918. [12] Macdonagh, *Brit. Med. Journ.*, 1918, ii. 31. [13] Asch, *Lectures on Gonorrhœa* (Strassburg). [14] Mueller and Oppenheim, *Wien. klin. Wochenschr.*, 1906, 32, 1368. [15] Brett, *Brit. Med. Journ.*, 1916, ii. 386. [16] Besredka, *Comptes Rendus à l'Académie des Sciences*, 6th May and 8th July 1912. [17] Nicolle and Blaizot, *Lancet*, 18th October 1913. [18] Howarth, *Brit. Med. Journ.*, January 1918, i. 4. [19] Lumb, *Brit. Med. Journ.*, 6th October 1917. [20] Thomson, *Lancet*, 28th June 1919. [21] Lees, *Lancet*, 28th June 1919. [22] Boyd, *Can. Med. Assoc. Journ.*, August 1918, p. 706.

A FIELD AMBULANCE IN GALLIPOLI, EGYPT, PALESTINE, AND FRANCE.

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XI. El Arish!

Within a short time after the battle of Romani, by dint of hard work in which a thousand and one details came up for consideration and settlement, we were ready to move if required.

The ambulance was organised into a mobile section which was to accompany and serve its infantry brigade, a mobile convoy equipped with a large amount of camel and horse transport to evacuate patients from the forward section to the third portion of the ambulance, and the main dressing station, which moved forward with railhead. As the fighting troops might, in emergency, push out into the desert many miles from railhead, an additional ambulance convoy was organised later on. So that, in the end, the field ambulance consisted of: (1) mobile section, (2) two mobile convoys, and (3) main or headquarters section, each complete in officers, men, equipment, and transport.

In theory the scheme was good, but in practice it proved unwieldy and inelastic, and although devised to increase our mobility it had the very opposite effect. It was eventually abandoned and we returned to the conditions which had existed before, in which we had an ambulance whose chief characteristic was plasticity, and which could at a moment's notice be adapted to suit the most varying needs of the time.

It was not till the 12th October that the troops moved out of Romani finally for the crossing of the desert. On such an occasion the spirits of all run high. The day was hot, but not with the intense heat of midsummer, as the long parallel columns set off eastwards with the slow half-shuffling pace acquired on the sand.

It was a great event. The spirit of adventure was in the hearts of all as they said good-bye to Romani that morning and marched off into the desert and the unknown. An element of romance always weaves itself round the place or the object of one's ambition. As they set off with their eyes towards the east that day the goal of their dreams was El Arish, for it was the gateway to the Holy Land, it marked the boundary of British rule and it was a town. The pleasure which we derived from the sight of a

town and its life can only be appreciated by those who have lived long in the desert. El Arish before Christmas, and then, who knew, perhaps Gaza or Beersheba, or even Jerusalem.

When once it started, the army continued its forward journey by leaps and bounds for over five months until it was finally arrested before Gaza.

The mobile section and convoy of the ambulance accompanied the brigade throughout, whilst meantime the other section was left at Romani.

The progress of the troops was conditioned by the railway and by water, and every stage was in deliberate succession to the one before. For reasons which varied from place to place and time to time, the length of the breathing pauses during the advance varied greatly. At times the progress was slow, at other times it was rapid. Thus the records show that the ambulance was at El Abd on the 15th October. Salmana was reached on the 27th of the same month, and Mazar on December 8th. On 18th December a point 128 kilometres * from Kantara was reached, and then for the first time El Arish was seen in the far distance, standing as it seemed to us just in from the shore beside a long luxuriant stretch of palms. Little of the town itself could be seen from this distance. Standing out prominently white against the dark green trees was the dome of the mosque.

If you want to enter into our feelings that morning as we gazed eagerly eastwards towards El Arish, you must try and imagine the circumstances. For months we had toiled across the soft burning sand. Morning, noon and night all round us, as far as the eye could see, there had been the broad stretching desert with nothing to vary the monotony of the landscape except that now it was flat and bare, at other times it was rolling with small hummocks covered by sparse shrub, on which the camel could snatch a meagre meal. On occasions a clump of palms clustering round an oasis would soothe the eye. And latterly the long belt of the Magara Hills that stretched across the southern horizon, with rocky valleys dipping deep into their side, helped to diminish the sense of oppressive illimitableness which the desert inspires. But even they wore a hostile look, for we knew the Turk was lurking there, ready to strike at our flank, and, closing in on us as we advanced, the threatening aspect of the hills seemed to increase.

* In the absence of other distinctive means, we marked our progress by the railway, in terms of kilometres.

But, for the most part, we had spent months, which seemed to us years, of hot, unceasing monotony. And through it all our goal was El Arish. "El Arish by Christmas" was the watchword that had sustained us as we marched wearily on.

As we now beheld it in the early morning, sixteen miles away, the reality was as good as the figment of our fancy. A few more day and then El Arish and the Holy Land!

By this time, it was rumoured, the mounted troops had occupied the town without opposition, and this was confirmed when we saw a brigade of our division march off to take possession. Within a day or two our own brigade, with the ambulance sections attached, was camped in bivouacs on the seaward side of the town, near the extensive palm grove.

El Arish was no exception to the oriental towns as we have seen them. It consisted of closely packed mud houses, with flat roofs and courtyards accommodating, during the day, the family, the poultry, and the household animals, and in which the domestic refuse of ages had gradually gathered. There are few things on earth more repelling to every sense than the yard of an Eastern house, and El Arish was no exception. Unless on duty, you did not linger long in its narrow, winding streets.

A large number of the natives were in the town when we arrived. Some had been there throughout the Turkish occupation, others had flocked back from the surrounding regions with the advent of our troops.

This reoccupation of the towns by their original inhabitants was one of the striking incidents which we noticed time and again during our progress through Palestine. To avoid the extortions and escape the evil ways of the Turkish soldiery, many of the natives had migrated with their families into the surrounding wilderness, driving their flocks before them. Preferring the dangers and discomforts and risks of starvation to the greater perils of the towns, they would wander about till the appearance of the British troops proclaimed the restoration of law and order.

There was a tragic touch about the whole thing, and yet on occasions it was not without its element of humour. Whilst many of the natives forsook their villages to escape the Turk, others, either because they had been inspired by their masters with a dread of the British soldier, or because they had been left no choice in the matter, had, as we advanced, moved northwards with their flocks and families into villages behind the retreating Turk. At one time our progress was so rapid that villages were

overrun and captured, and the Turk himself had just time to escape. The people, who had fled from the villages further south, then showed a great panic to get back to their native villages.

This was a common experience throughout the campaign in Palestine. But we recall one occasion specially. It was one early morning, when we were moving along the road from Herbieh to Esdud, hot on the track of the retreating Turk. Coming in the opposite direction we passed a constant procession of returning fugitives. There were all sorts and conditions. Old and young, men and women, boys and girls, the majority walking, others mounted on donkeys or riding on tumble-down carts of every description—all eagerly retracing their steps, some actually running in the vain hope of recovering the household goods they had forsaken in their hurried flight. I suspect their hopes were vain, because in war the looter is abroad in every village, and a forsaken home is soon robbed of everything of the smallest value.

When we arrived at El Arish we found a large number of the natives there. The majority of them were wretched and hungry, and the Military Governor, who had returned to the town after the arrival of the British troops, was anxiously engaged in making provision for their needs.

Very soon the occupation by the British troops was accepted by the people as a deliverance from oppression and a certain return to normal life became apparent. The imam could be heard shouting the muezzin at the appointed hours to call the faithful to their prayers. The women and girls trooped down to the wells on the outskirts of the town with jars on their heads to draw water—a sight in the East which always appeals to the western eye, alike from its reminder of the Bible times, as from the natural beauty of the picture. The Oriental woman has a grace of carriage which is her chief, and, it must be confessed, often her only charm, and this is never more evident than when she is walking with a load on her head. So pleasing was the picture to the Tommy, that there was often an admiring throng with cameras gathered round the wells, and the attention which the women got caused them evident satisfaction, for they would linger whilst our men, in the broken Arabic which they had gathered in Egypt, attempted to establish a meagre conversation.

It must be admitted that the pleasure which the men derived from the proximity of a town was born very largely of the opportunity it gave them to see the opposite sex. And can you blame them? For to the Tommy, as to us all, one of the dominating

misfortunes of this war is the removal of the pleasures derived from the company of the gentler sex. And this deprivation is one which has especially characterised the campaigns in which we have been engaged. Ask any man and he will admit, if you get a heart-to-heart confession from him, that after Gallipoli one of the greatest pleasures of all associated with the return to Egypt and civilisation was just this one of again beholding the divine figure of the fair sex after many months of the cruder association of his fellows.

We have all felt it, and we can understand and sympathise with the natural and innocent instinct which attracted these men as they paid their homage to the first women on whom their eyes had rested for many months.

It was whilst we were at El Arish that the mounted troops rounded up and defeated a body of Turks at Magdaba, capturing about a thousand prisoners. It was a very successful affair. A large number of the casualties, British and Turkish, passed through our hands. During this action our transport was hurriedly called out to the help of the field ambulances of the mounted troops. The call came during the night. It was unexpected and the men were all in bed. Despite this, the mobilisation was carried out so quickly that it constitutes a transport record of which the unit is proud to the present day. The men turned out, the mules were harnessed-up and hooked-in, and in twenty-two minutes the column of seventeen sand-carts was on the move for its long journey eastwards across the sand. The N.C.O. who was in charge and the men whose spirit rose to the call of duty in this memorable way all merited high praise. A special congratulatory message was received by the officer in charge of the ambulance section from the general officer commanding the Australian mounted division on whose behalf the transport was turned out.

During the last weeks of the year the weather had changed, and instead of the days of constant sunshine with skies cloudless and clear except for the haze which excessive heat often produces, we were now suffering a complete reversal in climatic conditions. Days of teeming rain were succeeded by days in which a wind from the sea lashed us with a cold fury. The cold was on some days very great indeed, and after the months of desert heat it chilled us right to the bone and drove us shivering to the shelter of our bivouacs or our tents.

One of the greatest trials of desert wind is that it lifts the sand in great dense clouds. On such days sand dominates your

whole life. It gets into your eyes and blinds you. It mixes with your food. It is driven into your bivouac or your tent and you find your table and your bed covered beyond recognition with a thick yellow pall. And do what you like you cannot keep it out. It percolates through the tiniest crevice, and the hand-bag, which you had locked and rolled for safety in your blankets, you discover on opening is half-full of the finest silt.

The worst storms we had were about Christmas, when the wind and rain were intense. On Christmas night, after we had retired to rest from the meagre celebrations which the desert fare allowed, the storm swore vengeance on our jollity; it rose in increasing force and, suddenly uprooting our tents, it left us helpless and bedraggled to face the evil night in our pyjamas.

A tempest completely alters the configuration of the country. You can watch the contours change from day to day. The wind catches the hills of sand in its course and it blows their tops right off, so that mounds become smaller and hollows become filled in. In course of time hills may be shifted bodily some yards away. The least wind will ripple the sand into fine waves as if it were playing over a calm sea, and, if you examine the sand wavelets, you will see that the surface away from the wind is steep and it meets the flat, rounded surface in a sharp edge. Exactly the same phenomenon is often seen in the larger mounds and hills of the desert. The surface towards the wind is blown right over the leeward side, which becomes steeper and steeper. In some ways the process closely resembles the waves of the sea breaking on the shore. Here the summit of the wave topples forward in a sharp edge as its base is arrested. Modified by the medium, the phenomenon is almost similar in the wavelet and the hill in the sand. The sandy formation thus produced, or scree, as it is called, is one of the most characteristic features of the desert. As the prevailing wind blows in from the sea—from a direction almost due north—these screes face towards the south. Sometimes the steep edges may drop precipitously several hundred feet to the surrounding desert, and on several occasions our sand-carts and camels have just escaped tumbling headlong to disaster whilst on trek during a dark night.

It was whilst we were at El Arish (5th February 1917) that the news of America's entrance into the war first reached us. It came as a surprise, for, removed as we were so far from access to the world's news, we had not followed the events which led up

to this startling development. The announcement stirred the hearts of all.

Meanwhile the preparations for the continuation of our onward journey were being pushed ahead. Stores of food and ammunition and materials had been accumulated mountain high and the next stage of our journey began.

We said good-bye to El Arish with feelings of genuine regret, for after the broken weather at the end of the year the time passed pleasantly. The afternoon intervals between work were filled in with bathing and cricket or football on the sand.

XII. First Battle of Gaza.

At the end of February we packed up and left El Arish, pushing some six miles across the desert to El Burj. We were now in Canaan. The ancient boundary between Sinai and the Holy Land was the river of Egypt, which has been identified with the Wadi El Arish. This is a shallow river bed which grooves the sand and opens at the sea in a broad, flat mouth which runs through a large grove of stately palms. It is dry all the year round, except for a few days in winter, when the heavy rains which fall on the Magara Hills flood the wadi bed. This happened during our stay at El Arish, and then during two days we had a sight of flowing water in the arid desert, the first we had had since we left Egypt many months before.

There is little to distinguish the country on the north side of the wadi from that on the south. Everywhere, as far as the eye can see, there stretch the same rolling dunes of yellow sand covered with sparse tufts of green growth. Some miles inland the Magara Range runs parallel to the the coast, whilst to the north the blue sheet of the Mediterranean extends in a great broad expanse to the horizon.

After a few days at El Burj we moved seven miles further on to Sheikh Zoweid. Here for the first time the unending barrenness of the desert becomes broken by patches of a uniform green. We can never forget the sensations of intense pleasure with which we feasted our eyes on the orchards, meagre though they are, which cluster round the village, whilst a mile or so beyond there burst upon our sight the glorious spectacle of a green field. It seemed many long years since we had last seen the green valley of the Nile. The fancy was captured by the unwonted vision, and eager pilgrims set out from the camp to pay their homage to this token of a bountiful Nature.

The desert still stretches this length in a belt of bright yellow sand about three or four miles wide which borders the shore. On the inland side the ground is firmer and for the first time there are tracks with some semblance to solid roads on which a motor car can be taken. But the soil is largely composed of sand, and the vegetation which now covers the surface in scattered patches of green has to struggle hard for a precarious existence. The fields of barley which charm at a distance with their mantle of green are found on closer view to consist of scanty stalks—a picture of sorry agriculture to the western eye.

But we were on firmer soil at last and our hearts rose at the prospects of leaving the desert behind. We were not yet ready to continue our onward journey, and we spent our days in the preparations of drill and marching with full equipment to accustom our feet to the new soil. We shod the horses anew. We removed the wooden "boxing" with which we had closed in our waggon wheels in the desert to prevent the sand from flowing between the spokes and gathering on the rim and so impeding their progress, and in a hundred ways we bethought ourselves of the new methods required for our altered circumstances.

The section of the ambulance which had been left behind at Romani some months before joined with the mobile sections at Sheikh Zoweid, moving up by train.

We were at last ready, and on Sunday the 25th March the division struck its bivouacs at Sheikh Zoweid and moved northwards in a long procession. To shorten the column we marched in three parallel strings, first the personnel, then the sand-carts, and alongside on the outer side of the column the camels three abreast.

Rafa was reached shortly after midday, and then it became evident to all that something was afoot. There was a few hours' halt, during which the camp was thrown into serious confusion by several of the camels which went mad and tore about, scattering the equipment and stores and cacolets broadcast. By 5 P.M. we were restored to order and moved out behind our brigade past the white stones which mark the boundary of modern Palestine.

The southern side of Khan Yunus was reached, and here we planted our camp in the dark. The night was damp and misty, and cold with a cold that reached right through to the marrow. The next hours were spent in gathering rations and water, for we were due to set out early the next morning. We breakfasted at 4 A.M., and whilst it was yet dark the camp was astir with move-

ment. The camels and horses were fed, and the loads were fixed amid a bustle and confused din in which the voices of our men and the jabbering native drivers and their grunting camels vied with one another for mastery. With cold that made the teeth chatter and a mist that drenched through everything to the skin, it was a sorry throng that hurried about its duties that morning in the lamplight.

Just as the light of day broke through the canopy of drifting mist we moved off behind the brigade. The sun soon tore aside the last curtains of fog that hung about our path, revealing the broad spreading orchards of Khan Yunus and fields laden with crops and oranges enclosed in their low mud walls. It was a rare vision of rich beauty and plenty that met our gaze that morning whilst we were yet hardly over the fringe of the barren desert. Natives thronged the streets as our long column wound through the village, keen to dispose of their wares of large, luscious oranges at three for a shilling. Despite their price we bought them lavishly and enjoyed them as the thirst acquired on the desert sands alone knows enjoyment.

It was a memorable morning. The tangled, solid mass of men, horses, and camels pushed its way at a dragging pace through the village, and then we struck across a broad open stretch of bare ground straight for Gaza. In a few hours we arrived at Deir el Belah, and whilst the battalions pushed on ahead we unhooked our teams and led them to the water at the village.

By this time the noise of battle on the hills in front where Gaza lay was growing loud. The Turk had been driven back from one position after another. The mounted troops some weeks before had dislodged him from his strong defences at Rafa after a stiff fight. He had now fallen back on the hill line with Gaza standing on its heights—a position of tremendous natural strength—at the end towards the sea, and Beersheba at the other end, thirty miles or thereby inland.

From Belah the ground extends northward for several miles in a flat plain, flanked on the west by the rolling dunes of the sand-belt, on the east by rough, rocky ground which rises in places several hundreds of feet high, and throughout is deeply cleft by steep winding wadis or gullies.

On the north the plain stops at the broad bed of the Wadi Ghuzze. The hills on the right fall away on the north and east into a flat plain. Standing on these heights, one can see away to the east the wadi twisting across the plain until it is eventually

Wadi Ghuzze with Small Tributary Wadi.

lost to sight behind the flat-topped height of Tel el Jemmi which stands in curious solitude, an abrupt mound rising in the flat.

Four miles or thereby from the Wadi Ghuzze the large town of Gaza stands on a commanding eminence, and its long stretch of white and coloured buildings and turrets can be seen for miles around. A massive grove of palms fronts the town and as you see it from below seems to conceal from view its eastern extremity. When we first saw the town the Dome of Gaza formed a distinct landmark, especially when its surface caught the rays of the western sun. But an explosion in the town early wrecked this interesting historical structure, and I do not think its loss was greatly bemoaned by our commanders for it must have been a valuable point for observation for Turkish guns.

Close against the eastern side of the town as you gaze from the plain, but in reality a matter of a mile and a half away, stands the prominent height of Ali Muntar. This is the mount before Hebron to which Samson carried the city's gates on his shoulders.

To an army the approach of Gaza from the valley of the Wadi Ghuzze is by four shoulders of rising ground. On the seaward side there is the undulating belt of yellow sand, to the east there are two ridges of irregular ground which run roughly north-east and south-west and are separated from one another and from the sand-belt by deep valleys, whilst further to the east a long hill which rises from the wadi bed some miles inland extends crosswise towards Gaza. The arrangement of these four rising backs of hill as they converge to the town may be likened to the spokes of a wheel with Gaza as the hub, surmounting the dominating height in which the rising slopes all meet and end. It was a position of great natural strength, as we were to discover ere long.

In the early afternoon of that day we followed the infantry of our brigade behind the sheltering banks of the high ground on the right and stood by in reserve ready to move. The noise and stir of battle was all around. Our guns were battering the slopes before Gaza and Ali Muntar, and in the intervals the crackle of machine-guns and rifles could be heard on the far-off ridges which our troops were scaling. Climbing the high ground in front of us we got the whole position stretching in panorama before our eyes—a diagram of moving battle such as we had never seen before. Scattered bodies of horsemen crossed the plain or climbed the hills beyond, in places here and there the little bunch of white tents showed where the dressing stations stood, guns and ambulance carts could be seen moving to and fro

behind any shelter there was, whilst scattered batteries flashed as their guns poured their shell amongst the Turks. Beside us the generals, surrounded by their red-capped staff, eagerly watched the progress of the fight, whilst messages flew across the wires that buzzed in the signal-waggon near by and round which there eddied an unceasing stir of orderlies on motor-cycle and horse. It was a thrilling sight, reminding one of old-time battle.

An airman who landed near gave us the latest news of the fight. He had just flown low over the field and saw it all. The cavalry had encircled the city. He had seen their horses as far as the shore on the further side of Gaza and our infantry were on the outskirts of the town on this side. The town would fall by 6 P.M. There could be no doubt of it. It was just a matter of hours now.

But it was not to be. The ground was won and victory lay with the rich prize within a hairbreadth of our grasp. But the cactus hedges bristling with machine-guns held back our infantry as they stormed the city wall from the southern slopes. They fought with an intrepid dash and determination that all have learnt to admire, but they could not pierce the solid wall of defence. The cavalry bore the brunt of the battle and many are the deeds of gallantry that they performed. They entered the city and carried off some Turkish guns and a Turkish general, who was surprised riding through the streets in his cab. Guns and general and cab were all led back in triumph. But the horses could not hold out, for there was water to be had nowhere. Though victory to our arms was as near as it ever was, the attack was called off for the time.

The next morning we watched the weary horses filing back in long lines to water and we saw the infantry march in to rest after their days of intense trial.

Later in the day we pitched our camp beside the main Gaza road and lent our help to the ambulances of the other divisions which were being sorely pressed. All night long convoys of sand-carts and camels converged to our camp and our twin lights, like moths round a candle. The lighter cases were carried off to the C.C.S. at Khan Yunus by camel, the more urgent cases by motor ambulance cars which were already on the road.

After a few days of unsettlement, in which our movements were in debate by those in authority, we settled down to another period of preparation.

So ended for us the first battle of Gaza.

XIII. Second Battle of Gaza and After.

The next days were spent in gathering forces, and stores of food and ammunition for the next assault on the hill fortress which we had failed to reduce at our first attempt. We had outstripped the railway, but this rapidly overtook us at the rate of a mile a day, and before long we had all the accessories of war in ample measure ready to our hand. Among them a casualty clearing station was pushed up to the railhead at Belah and our ambulance problem was lightened. The roads were improved, ramps were cut across the Wadi Ghuzze for troops, waggons, and guns, and deep wells were dug in the wadi bed to overcome the dearth of water which had handicapped our previous attempt.

These were busy days. From early morning till far into the night fatigue parties were strenuous with pick and shovel clearing a way over trackless waste or through wadi bank so that the next onrush would sweep over the further hills in a great encircling wave, with nothing to impede the men and guns and supplies moving forward in deliberate irresistibleness over prospected roads. Infantry in fours here, field guns and waggons there, whilst over other tracks and other wadi crossings only heavy guns would pass. With faultless precision and an organised scheme, which foresaw and met every contingency of battle, the staff worked out their plans.

The Wadi Ghuzze, which stretched to the sea between us and the Turks, formed a great barrier between the opposing forces. Fortunately the previous battle had ended in its passing into our possession, though the Turkish patrols came right to the further bank at night. During the day our preparations were pushed apace without disturbance except for the Turkish shells that fell in spasms amongst our working parties. In a few days there were crossings at all important points. In many places this necessitated deep cuttings in the banks, which often rise sheer from the bed to the height of twenty or thirty feet. It was strenuous work and the days were hot, but the large parties told off for the duties soon cut ramps sloping in gentle gradients from the ground level to the sandy wadi bed.

During the summer, and late into the winter, the wadi is dry, though its high, sharp banks show that with the winter rains the torrent that tears along to the sea from the inland hills must be deep and strong. During the dry months there is a running stream hidden below the wadi bed, as is shown by the large spring

that gushes in a constant current from the ground near the mouth of the wadi. This subterranean river was tapped by wells dug at intervals, from which the water was raised by pump for the supply of man and beast. As is natural, the deeper wells were further from the mouth, the shallower wells were near the sea. A remarkable discovery which was made during the digging of these water-holes—and the same fact had often been noticed in the desert before—is that the salinity of two wells separated from one another by only a comparatively few yards may differ very greatly. The one might be undrinkable for man or horse, the next might be as sweet as a highland spring at home.

After two weeks of preparation we were ready for the next attack. This time our division was to be engaged and was to be placed in the centre of the frontal assault on the slopes facing Gaza. Another division was to advance along the dunes by the sea, whilst the other infantry and the cavalry were to sweep round from the right. This was the general scheme as we knew it. There were endless details of disposition and of attack which it is too early yet to relate.

On the 16th April the brigade with which we were affiliated moved forward across the wadi under cover of dark and placed itself astride the shoulder of ground that slopes in a series of rising knobs from the further bank of the wadi up to Ali Muntar. Here they dug themselves in. The dressing station followed, installing itself in a quarry situated in a sheltered site behind the lower slopes.

The bombardment preceding the attack commenced on the morning of the 19th April and lasted from daybreak for several hours, after which the troops all along the line advanced to the assault on the higher hills that guard Gaza on the south. The fight continued hard and fierce during the forenoon and well into the afternoon. The troops advanced for a time despite the dense wall of fire that burst out from the guns and machine-guns which the Turks had kept waiting in silence in expectation of this blow. The day was burning hot, but still our gallant boys threw themselves against the Turkish defences in repeated efforts. Those who saw it all will tell you that these rugged hills in front of Gaza saw that day deeds of daring and courage that should rank high in the annals of British battles. Ground that was to be of great value in later days was wrested from the Turk, but the solid wall of shot could not be pierced despite it all and the order to cease fire was given. The night was spent in consolidating the gains.

During this battle the ambulance was heavily engaged and our losses were severe. The advanced station moved forward with the troops and was finally established in a deep wadi far up on the hillside. The main station was placed on the left bank of the Wadi Ghuzze and between the two, for twenty-four hours, the convoys of camels and sand-carts plied with their load. Early in the day, thanks to the success with which the wadi had been ramped for traffic, we were able to get our motor ambulance cars pushed right up to within a short distance of the battle zone.

We shall always look back upon these two days—the 19th and 20th of April 1917—as the most supremely trying days which we have ever spent. Amongst all the battles into which the fortunes of war have thrust us, this stands out pre-eminent for its stern grimness and tense trial bordering on disaster. The only experience which ranks beside it in the long chapter of our fighting in foreign fields is the battle of Achi Baba in July, two years before. So dominating a place does this second battle of Gaza occupy in the memory of us all that it seems cheapening these days of grave anxiety to the verge of affectation to slip them past with only a few lines of record. But these times of past conflict are still too close on us and the needs of secrecy are still too impelling to allow the pen the licence required to do justice to experiences which often wore the character of things that change the whole course of a man's outlook and being. Such for us was the battle that raged round these heights before Gaza during that day of April, with its aftermath that tested the courage and endurance of all.

For their gallantry during this action the officer in command of the advanced station (Captain Greer) received the Military Cross and a sergeant the Distinguished Conduct Medal. The official statement of the deed which won the latter honour is given here. It reflects the greatest credit on the N.C.O. and the men who worked under his command.

"327. Sergeant Andrew Messer. Exceptional gallantry and devotion to duty before Gaza on 19/4/17, when he supervised the collection of wounded during constant shell and rifle fire. At one time, in the absence of an officer, recognising that the regimental aid post of one battalion was becoming congested, he hurriedly organised a line of stretcher-bearers, and steadied and encouraged them while the wounded were being removed.

During the night of the 19/4/17-20/4/17 he was in charge of

stretcher-squads which went forward to try and rescue seventeen officers and other ranks who were lying in a position of great danger. This entailed about four hours' work, during which he guided his party over extremely difficult country. He rescued some of the wounded and brought them back to the advanced dressing station. Although exhausted, he persisted in going back and was successful in recovering and bringing in the entire party. This exceptionally good piece of work was due very largely to his pluck and endurance. He himself helped to carry the patients. At the end he arrived back in camp in a state of collapse from exhaustion."

In addition to the memorable work of the R.A.M.C. personnel, officers and men, mention must be made of the gallant and untiring services rendered by the transport of the ambulance during the battle. It usually happens that the deeds of the A.S.C. in battle are carried out in comparative obscurity. Surrounding their work there are relatively few opportunities for that glamour and display of outstanding and sometimes dramatic bravery which often attends the work of the stretcher-bearer, whose lot is cast during battle far forward in the zone of shot and shell. The A.S.C. personnel, with their mules and carts, are naturally limited in their activities to a sphere further behind. Despite this, the risks run and the chances of good service may in their own way be as great as are experienced by their fellows in the front line.

So it was during this battle. For thirty-six hours the ambulance carts moved backwards and forwards between the advanced dressing station and the main station, and every now and then, when the casualties were gathering fast at some regimental aid post far up in front, they were pushed forward to relieve the congestion. A rule which is only rarely broken prescribes that the transport of an ambulance does not advance beyond the advanced dressing station. But in battle there are occasions when every rule must be broken. And during this fight the rules of transport had to give way to the urgent circumstances of the moment.

It is not surprising that our casualties amongst the animals were heavy. On this occasion they were unusually heavy. But by a miracle we had no casualties amongst the A.S.C. drivers.

There were several deeds of outstanding gallantry on the part of the men, but as so often happens in battle there were so many recommendations from all parts of the field that every deserving man could not receive his decoration. Our men were recommended, but without success. From the warrant officer in charge of the transport, on whom falls on such days many stiff problems of

organisation and of roads, down to the most junior A.S.C. driver, the services rendered are worthy of all praise.

During the battle, also, we were largely dependent on our cacolet camels and their Egyptian drivers for the clearing of the wounded from the field. In battle the stoical camel is a creature to inspire admiration in the hearts of all. Hour after hour he crosses and recrosses the shell-swept zones, carrying water, stores, or wounded men, with an indifference to danger and a patient, uncomplaining endurance which nothing can interrupt. Over the whole field of battle there is no greater demonstration of heroism than that exhibited by this silent, stately animal. The native driver is admirably suited by nature for the work into which his lot is thrown. He seems to borrow from his dumb comrade the qualities of persisting brave effort. Many were the deeds of gallantry performed by these common Egyptian fellaheen during their repeated battles in the desert and in Syria. Decorations meant nothing to them. The only way of rewarding the lower Oriental is by money. A reward of three or four pounds sterling was presented to those who had distinguished themselves in an outstanding manner. It meant more to them by far than the V.C. would have done.

After the second battle of Gaza we settled down to trench life to wait for the next stage of the struggle. We heard that a new General-Commanding-in-Chief had arrived and we knew that this would soon spell new methods of work for us in the front areas.

With the break in the suspense of battle we had time to look around and we recall the interest which the natural history of the place soon developed in our midst. At our first arrival the fields were green with young barley and the pastures were covered with a multicoloured carpeting of flowers which could not but charm our eyes and hearts after the sombre yellow bareness of Sinai. There were daisies spread in thick beds, with irises, poppies, and a mingled multitude of blossoms strange to our eye. Ants were plentiful and the crawling things of the earth were legion. When the candle was lit in the bivouac at night one could see as one lay abed a whole host of life springing into being as if at the touch of a magician's wand—gnats and other flying creatures of all sorts and shapes and colours. There was one specially resplendent, with a long dumb-bell-shaped body of a deep red hue and four gorgeous wings of cream striped and speckled in black. As he clung to the wall of the bivouac, with his two black beads of eyes

fixed in a stare of fascination on the light, he inspired one with a curious mixture of eeriness and admiration. Spiders in armies crowded round the light—large, small, slow, rapid. One large fellow had a habit of tearing about in a feverish haste as if he had not a moment to lose. Caterpillars crawled upwards along the grass twigs into the area of light and swung about in ecstasy in mid-air.

For a week or two in the spring we watched the fire-flies flitting about in the dark round the bivouac. Their sparkle of throbbing light as they dart hither and thither is a natural phenomenon absorbing to see. We watched their torch whilst they were at rest. Even whilst you are examining the fly with a light it still glows and fades—a veritable electric lamp on the ventrum. You can easily satisfy yourself that it is not due to the passage of electric sparks between the wings, an explanation we had heard somewhere.

In the fields birds are plentiful—larks, wheatears, sparrows, vultures—and at one time we saw quite a number of kingfishers in a startling robe of purple and green.

During the rest of the summer the ordinary routine of the camp kept us occupied. Amongst other activities we threw ourselves with renewed zest into the problems of sanitation, and by the end of the summer we prided ourselves in the thought that, thanks to the enlivened sanitary conscience of the troops and the response which our efforts met on all hands, our field hygiene was well-nigh perfect. We certainly were gratified in the thought that sickness in the Army was reduced to lower figures than we had ever known before.

The preparations for the coming battle which we knew would flare up again ere long were pushed ahead, and although the long spell of waiting was not to our liking and tested our patience, there was plenty for our hands and our minds to do.

XIV. Third Battle of Gaza—Hesi.

The battle, which had long been prepared for, commenced on the night of the 1st November with the most vigorous artillery outburst which we had so far ever seen. It was known to all that guns, large and small, had arrived to storm the strong Turkish defences, but none of us had in our wildest dreams pictured the massive intensity of the fire that broke out that night at the appointed hour. It was as if the Furies, which had been straining at their chains for many months, had with one sudden, supreme

effort at last burst loose. For hours a tornado of high explosive and shrapnel poured on to the Turkish positions, and, standing on the sandy knoll on which our camp was placed, we could watch the storm of flame breaking round the summit of Samson Ridge. Though several miles away, we could see the sand-crests in front of Gaza lit into distinctness as the brilliant flashes rent the darkness of the night.

The official records will tell you that the division which was to storm the Turkish strongholds in front of Gaza and towards the coast was reinforced by a brigade of our own division. For several days and nights there was intense fighting, in which the land guns were joined by the guns of the fleet of warships standing out from the shore opposite Gaza, which poured an incessant fire into the Turkish flank.

Steady progress was made though the Turkish defences were powerfully constructed and heavily manned, and each day brought news of the victories on our right towards Beersheba, where our heaviest attacks were launched to turn the Turkish left flank.

Bit by bit our battalions gnawed into the Turkish front on the belt of sand, and within a day or two the sand dunes along the shore were cleared from Sheikh Ajlin as far forward as Sheikh Hasan. We were now round the seaward flank of the Turk, and his left flank towards Beersheba had been broken, so we were not surprised when, in the early morning of the 7th November, we heard that the Turk was retreating.

The word for which we had waited so many months at last arrived in the late morning: "Be ready to move at half-an-hour's notice." The tents were struck, the blankets rolled, the camel-tanks filled with water, and the panniers, stretchers, etc., all laid out on the sand in camel loads. Never was order obeyed with greater spirit. Within an hour or two our long procession was in motion across the sand and joined up at Sheikh Ajlin with the brigades which were marching in column northwards along the shore.

The spirits of all ran high. Everywhere the sense of victory was abroad. I doubt if there is anything can stir the heart and fire the pulse of Scotsmen like battle breaking into victory.

The last five days had been days of stern struggle. They had fought hard and fiercely, and many a grim story could be told of the nights which had been spent in bloody encounter on the dunes and in the trenches, or rather behind the barricades on these rolling sand-hills facing Gaza.

As they set off that day in a long line beside the water's edge the grim Scotch faces were relaxed. The memory of repeated, anxious struggles was dispelled by the magic touch of victory. They were tired with weary nights but, as they marched off, you could see that their hearts pressed forward with eager desire.

Gaza was captured or as good as captured. But by a strange turn of fortune we were never to set foot in the town before which we had sat for so many months. Gazing on it from the plain, with its buildings and towers stretching along its commanding height, we had often looked forward to the time when we would march through the streets and over the height of Ali Muntar. But we were never to realise our dreams.

We continued our march along the shore to near Wadi Hesi, where we camped for the night. Our brigade pushed forward to occupy the sand dunes extending inwards from the shore. Next morning at dawn we were all afoot again and set off behind the brigade. In a short time we reached the Wadi Hesi, which was crossed at its mouth. At this point we came under observation from the Hesi Ridge and our long procession of camels and sand-carts was severely shelled by the enemy guns. It was a moment of intense anxiety, for there was no shelter—nothing but a bare, broken stretch of beach. Fortunately the mules had gone forward some hundreds of yards to water, and a general stampede was averted. The camels, however, received a sorry knock. Despite it, the long procession moved slowly forward in perfect order. The camel tribe is not to be hustled even when faced by danger and death. At such a time theirs would almost seem to be an indifference born of fatalism.

Soon after crossing the Wadi Hesi the brigade deployed for the assault on the ridge of sand which bears the same name and which, rising in rolling dunes inwards from the sea, barred our further progress on this flank.

The advanced dressing station by nightfall was pushed up on to the western slopes of the ridge, and all night long the main dressing station on the beach was busy with the dressing and feeding of the wounded who were carried down the slopes on sand-cart and camel.

During the day willing workers had scooped the sand into holes which sheltered our patients from the enfilade fire that swept the beach. We were under observation both from the Hesi heights and from the more distant peak of Askalon, whose ruined tower shone out distinct and white as it caught the

R.A.M.C. on the March.

rays of the setting sun. Tents during the day were therefore impossible, but with dusk, which is always early in the East, we pitched our little camp by the water's edge and with muffled lights we organised our premises and got to work with a speed that comes only with practice.

To lighten the camels for a rapid move the great bulk of the tents and equipment, which had gradually been gathered during the long period of rest before Gaza, had been dumped before the ambulance set out on trek. The marquees and the hundred and one other items of equipment, which all make for comfort and spacious ease in a resting camp, are incompatible with a mobile column. Here only the barest requisites can be carried, and we were now depleted of all except these. Three operating and half a dozen circular tents was the sum-total of the tent accommodation carried.

But experience is a stern mistress, and she had taught us how to adapt our ways to suit our means. Within a short time you would see a host of bivouacs suddenly spring into being, constructed of stretchers or blankets held up with a few odd bits of wood always carried for the purpose. A simple blanket bivouac with the proper slope to its roof will keep out the heaviest rain, and under its cover a man will rest at peace while the elements storm all round.

Whilst the battle raged on the sand-hills we got our house in order, and with nightfall, when the wounded commenced to arrive in constant succession, we had our little camp ready. During a battle the intense work for us usually comes with the night for it is late before the wounded collected from the field reach the stations. And so it was that night. Once started, a constant traffic eddied round our dressing station all night.

There are some scenes of this and other campaigns that are fixed in our memory with a seal that time can never efface, and one of these is that little strip of flat beach just below the Hesi Ridge as we saw it that day. Behind us were the rounded hills of sand, with here and there a patch of scrub and trees, and an orchard, where the high ground dipped down into the wadi bed. To the north, as far as the eye could see, stretched the dunes of sand rising in the distance into the heights of Askalon. To the south lay the belt of sand across which we had come, whilst westwards spread the broad blue expanse of the Mediterranean. Ordinarily a scene of quiet, and with little unusual to attract the eye. Many such there are along that line of coast.

But as we watched it that day it had all the lurid fascination of battle. We could see our men in their parallel lines advancing over the knolls to the charge, through the storm of shrapnel that broke about their heads, and the high explosive bursting in great clouds of smoke that looked as black as jet against the yellow sand. On the near face of the hills our forward batteries were in constant action, served by the limbers that kept coming backwards and forwards from the shore; whilst from the sea the warships, which accompanied our flank on the journey north, sent their whizzing shells over our heads amongst the Turks.

And the beach itself! The seething mass of life crowded into that half-mile stretch of sand—camels, horses, guns, mules, limbers, and men huddled close under the low bank out of sight of the enemy posts—formed a scene of general confusion such as the battlefield alone can show and which no pen can depict. In the centre of it was the bare patch where our station lay, mingling with, and adding its quota to, the confused stir of life, and only discernible amongst it all by the Red Cross flag that flew in the breeze, and by the sand-carts, which we had tipped up to form shelters for the wounded, and which showed at a distance by their white rounded canvas hoods.

Near by, the 18-pounders were in action, where they had been unhooked from their panting teams earlier in the morning. The horses stood resting near at hand. At another place a body of engineers were busy raising water from their spearpoints pushed at random into the sand.

Amid this scene we worked away during that day and night. As the convoys arrive in front of the station, the patients are unloaded and sorted out according to their injuries. At one tent the full particulars, which the Army demands for accurate record, are compiled by the clerks as the men are led or carried past in order. No man must be missed at any cost. In the operating tents the surgeons are busy with the cleansing of the wounds and the application of splints. In one tent the cases badly hit receive special care, whilst through the other the slighter cases are led to receive any treatment necessary. Thereafter they are taken to another region of the station to be fed and to await evacuation.

Before being despatched every man must be fed, and fed well, because a wounded man is a hungry man, and after days of fighting and marching he is a thirsty man. Give him beef-tea, cocoa, or any other unusual beverage you think is good for him and he will not thank you. But give him pints of tea with plenty of milk

and sugar and his face beams with gratitude. So it is that, on such an occasion, the cooking and quartermaster's department of the ambulance are working at full steam, and the prospects of such an occasion repeated in close succession mean that many camels in your procession have to carry stores of food, that must be replenished constantly.

Then every man must be warm throughout his journey, for nothing is more likely to kill a wounded man than cold, and the nights of a Palestine winter can be very cold indeed. Blankets, and still more blankets, is the constant cry.

When you have marshalled sufficient wounded men for a convoy, the evacuation N.C.O. orders round the required camels and sand-carts from the transport lines close at hand. The loading up commences, and before long the procession of the maimed is on its way from the storm of battle to the comfort of the casualty clearing station. A few days before, we had watched these men all eager for the fight, with the smile of victory on their faces, as they spurred off from Gaza after the Turk. There is a smile on their faces again, still the smile of victory, but to it is added the smile of relief from a great strain.

During this action the ambulance had a great opportunity of useful work, and it availed itself of this opportunity to the utmost. There were many deeds of gallantry and devotion performed by all ranks—both R.A.M.C. and A.S.C.—and many honours might have been won but never came our way.

The only honour was the Military Cross given to Captain R. G. Walker for his gallant behaviour whilst in command of the advanced section.

(*To be continued.*)

CRITICAL REVIEWS.

RECENT WORK UPON "FILTER-PASSING" MICRO-ORGANISMS IN INFLUENZA.

By W. R. LOGAN, M.D.

THE first published piece of work upon "filter-passing" micro-organisms in the recent widespread epidemic of influenza was carried out by Drs. Nicolle and Lebailly.[1, 2, 3] These workers, by means of unfiltered bronchial secretions from influenza cases in the early acute stages, were able to produce illness in monkeys, using the subconjunctival and intranasal routes of inoculation. Using next the same material, which had been filtered through Chamberland L. 2 candles, they were able by means of subcutaneous inoculation to produce influenza or an influenza-like illness in two men.

Even before the publication of the work of Nicolle and Lebailly there had inevitably been a considerable amount of speculation as to whether the cause of the epidemics might not be a micro-organism which was so small as to escape notice in the ordinary stained films from the secretions of influenza cases and which was not cultivable by the ordinary aerobic methods used in the investigation of these cases; limited in scope, then, as they were, the experiments of Nicolle and Lebailly gave a great impetus to the investigation of cases of influenza from the point of view of the possible existence and significance of minute micro-organisms of this type.

A number of workers and groups of workers have therefore been applying themselves recently to this problem. Major-General Sir J. Rose Bradford, Captain E. F. Bashford, and Captain J. A. Wilson of the British Army in France had been for some time previous to the outbreak of influenza studying from this same point of view cases of acute polyneuritis and of other conditions.[5] They were thus in a peculiarly suitable position to study the "filter-passing" micro-organisms in influenza, as Wilson had already, through his previous studies, acquired a high degree of skill in the difficult and peculiar technique required.

A second group of bacteriologists, working independently of the first, though also in the army laboratories in France, were Major H. Graeme Gibson, R.A.M.C., who died of influenza while engaged in its study, Major F. B. Bowman, C.A.M.C., and Captain J. I. Connor, A.A.M.C., who carried out their inquiry on behalf of the Medical Research Committee as part of the general scheme of investigation into influenza which has been undertaken by that body.

Other workers on the same subject, approaching the inquiry from

a slightly different standpoint, have been Drs. Friedberger and Konitzer in Germany, and Professor T. Yamanouchi, Dr. Sakakami, and Dr. S. Iwashima working together in Japan.

In abstracting and criticising the experiments and conclusions of these workers, it seems better not to take each paper in chronological order but to divide the inquiry into its main partitions, and thus to attempt to assess the amount of proof at the present time available on the important points. The review deals therefore, in the first place, with the question of the isolation and cultivation of a "filter-passing" virus from cases of influenza; in the second, with the experiments upon animals, using filtrates of secretions and living cultures; and in the third, with experiments upon human beings.

PART I.

The Isolation and Cultivation of "Filter-Passing" Micro-Organisms.

The greater part of the evidence available upon this section of the inquiry is furnished by Wilson, of the Bradford, Bashford, and Wilson group, the remainder by Gibson, Bowman, and Connor. We shall therefore, in the first place, take that particular section of the work of Bradford, Bashford, and Wilson for which Captain Wilson is responsible.

The Cultural Experiments of Wilson[5, 6, 8, 9]*: The Technique of Culture.*—The materials used for culture were blood, pleural fluid and cerebro-spinal fluid, sputum and post-mortem tissues—all from cases of influenza.

Two methods of freeing the material from other micro-organisms were employed. The very small size of members of this group of organisms was utilised in removing other bacteria by means of filters, Berkefeld N and V being found the most suitable; Massen filters were found to be rather too fine as a rule for the organisms in question. The other purifying method used took advantage of their resistance to glycerine. This method was found not to be so useful in the influenza cases as in the other diseases investigated, partly because the minute organisms from the cases of influenza were found to be less resistant than those isolated from the cases of some of the other conditions, and partly because of the presence in sputum of other glycerine-resisting organisms.

Material purified or partially purified in this manner was then cultured by means of an adaptation of what is now known as the Noguchi method, which was first evolved by Noguchi[13] for the cultivation of the spirochæta pallida, and later used by Flexner and Noguchi[14] for the first successful isolation of the "filter-passing" organisms from the nervous tissues of fatal cases of acute anterior poliomyelitis.

The details of the technique of culture are given in Wilson's own words:

"Into each of a series of sterile test tubes (6 by $\frac{5}{8}$) a fragment, about the size of a pea, of sterile rabbit kidney is placed, and alongside it a piece of the nervous tissue, or a drop or two of the filtrate, whichever is under examination. Serum agar, in the proportion of one part of inactivated serum to ten parts of melted agar, at a temperature between 53° C. and 56° C., is added to each tube in an amount just sufficient to cover the tissue. After solidification of the serum agar has taken place there are added to each tube about 15 c.cm. of serum bouillon, also one part in ten, and at a similar temperature. Complete anaerobiasis is obtained by running on to the surface of the medium sterile liquid vaseline at a temperature of about 60° C. and to a depth of half an inch. The completed medium, therefore, consists of a thin layer of serum agar containing a fragment of sterile kidney tissue and the infective material, with a superimposed column of serum bouillon, the whole being sealed with a layer of vaseline.

"In the case of blood, pleural fluid, and cerebro-spinal fluid the cultures are put up in conical Erlenmeyer flasks of a capacity of 50 c.cm. It is sufficient to add 10 c.cm. of the blood or other fluid, the amount of agar being about 15 c.cm. In the case of blood and pleural fluid ordinary agar and bouillon are used; for cerebro-spinal fluid the serum constituent must be added. It is essential to put up a series of controls involving all the constituents of the medium."

The growth appears about the third day as a fine haze in the vicinity of the rabbit-tissue. This haze spreads through the agar and reaches the surface on the fourth or fifth day. The surface growth is confluent, yellow-white in colour, and finely granular. It does not extend into the broth. Wilson himself refers to the difficulties and fallacies attendant on this technique. Apart from the obvious liability to contamination entailed by the number of times the tube has to be opened, and by the variety of the constituents, he mentions that one of the chief sources of difficulty is the sterile kidney tissue, "which is not always sterile." He states that quite apart from the risk of contamination in removal of these organs, it sometimes happens that they are infected with B. pseudo-tuberculosis or with a bacillus of the Gaertner group, even though they appear perfectly healthy; and he lays stress on the necessity for the most careful examination of the abdominal viscera of the animal before using the kidneys.

Characters of the Micro-organism.—This micro-organism is a minute rounded coccus-like body, tending to grow in pairs and short chains, and varying in size from 0·15μ to 0·5μ. It is Gram-positive, passes through Berkefeld N and V filters and through most Massen filters. It is a strict anaerobe, and has so far been successfully cultivated only when Noguchi's technique has been used. From the description it would appear that there are slight differences between this organism

and the type of filter-passer isolated by Wilson from cases of polyneuritis on the one hand, and from cases of rabies on the other.

From the first "it apparently differs in a greater tendency to grow in streptococcal forms, from the latter in being less minute. It differs also in being less resistant to glycerine than are the minute micro-organisms isolated from cases of polyneuritis, encephalitis, and rabies, and resembles in its degree of resistance the minute organism derived from cases of nephritis, three to four weeks being for them the maximum period of viability in glycerine. Its distribution in the body of affected cases is apparently wide, as it has been cultivated from the heart, liver, spleen, kidney, and in one case from the brain and spinal cord."

In staining, there is difficulty in inducing these organisms to take up dilute aniline dyes as ordinarily used, and it is necessary to make use of a mordant such as tannic or carbolic acid, or alternatively to wash the fixed film with ether and then to stain for rather prolonged periods.

In character of growth in Noguchi tubes, the micro-organism isolated from influenza resembles those isolated from the cases of trench fever, nephritis, and rabies, and differs from those isolated from polyneuritis and encephalitis. The former group grows more rapidly, reaching the surface of the agar in from five days as compared with six or seven; and whereas in the latter the serum broth gradually becomes turbid, in the former it remains clear.

Wilson claims for these organisms "a certain degree of resistance to heat." From the description, however, it appears that this is only a resistance for 30 minutes to a temperature of 56° C. in the tissues and in culture, while in filtrates the duration of resistance to this temperature is less than twenty minutes. Remembering that in the tissues naturally, but also in Noguchi tube culture by the presence of serum and agar, the organisms are to a considerable extent protected from the heat, it is evident that resistance to heat is not actually a marked feature. Growth takes place only in the vicinity of 37° C.

A point of prime importance is the very high percentage of positive results which Wilson was able to obtain in the isolation of this organism from the blood, secretions, and tissues of cases of influenza. From pleural effusions, for example, he was able to isolate it in pure culture from sixteen out of eighteen cases; in the remaining two the fluid was purulent and pneumococci were present. From blood he obtained this micro-organism from twenty-two out of twenty-five cases. In addition, he claims that similar minute micro-organisms are demonstrable by the microscope in the secretions and tissues of a majority of cases, when a suitable staining technique is used.

Criticisms directed towards this part of the inquiry may be grouped under certain headings. The first and important question which may be asked is (i.) Has Wilson proved that the micro-organisms in question

were actually isolated from the cases? (ii.) Were these micro-organisms never isolated from normal people? Subsidiary questions which scarcely affect to the same degree the main issue are (iii.) Were the cultures pure or mixed? (iv.) Are the minute cocci a phase of a larger non-filter-passing streptococcus?

In dealing with the first question one must say at once that Wilson makes it clear that no one is more alive than himself to the possible fallacies of the Noguchi method, with regard particularly to the liability to contamination—firstly, by organisms having their origin in the rabbit kidney; and secondly, by organisms introduced from without during the necessary manipulations. This being so, we may assume with reasonable certainty that Wilson used every means at his disposal to eliminate the possibility of such contamination, and viewed his results with the high degree of scepticism which is necessary in drawing conclusions from experiments the technique of which is open to such fallacies. The lucid and detailed accounts which he gives of his technique, the delay in publication till the workers had accumulated what to them seemed sufficient proof, and the corroborative evidence of the animal experiments in infective polyneuritis justify one in assuming this to be the case.

The bacteriological technique being therefore of a high order, criticisms levelled against it are directed against the limitations and fallacies of the procedure itself and not against the manner in which it has been carried out. The question of extraneous contamination has been referred to, and we have assumed that every means has been taken to reduce to a minimum the chances of such contamination, and to detect it when present. On the other hand, the possibility of the rabbit kidney harbouring minute organisms of the type in question is a source of possible fallacy which it is very difficult to eliminate. The high degree of parasitism of the organism, its need for body temperature and complete anaerobiasis as conditions for culture outside the body, which serve to help in the differentiation between it and common saprophytic contaminations, are of no value in distinguishing it from a similar highly parasitic organism having its origin in the body of the rabbit. The large number of controls used would help in such a distinction; and further, the fact that the authors were at the same time working at cases (among others) of acute infective polyneuritis, and were able to reproduce that disease by means of cultures isolated from these cases, may be taken as valuable confirmatory proof that in the influenza cases also they were dealing with organisms isolated from the bodies of the patients themselves.

Nevertheless, the use of rabbit kidney in a fresh condition must always be looked upon as a weak point in the Noguchi technique in dealing with a group of organisms the habitat and other characters of which we know so little.

(ii.) In regard to the second question, Were these organisms never isolated from normal people? On this point evidence is conspicuously lacking. Bradford mentions that micro-organisms of this presumably heterogeneous group were obtained not only from cases of influenza, nephritis, trench fever, acute infective neuritis, and lethargic encephalitis, but also from cases of mumps, measles, rose measles, typhus, scarlet fever, hæmorrhagic chicken-pox, and vaccinia. It may at once be granted that such organisms are probably of widely varying type from the point of view of their pathogenic effect, although in the present stage of knowledge biological differences cannot be satisfactorily demonstrated. A criticism therefore which is founded on the assumption that the finding of apparently similar micro-organisms in diseases of such different types must throw doubt on their connection with these diseases is illogical and unfair. It may be recalled, for example, that a comparatively short time ago there was no means of differentiating by their biological character such widely differing micro-organisms as B. coli, B. typhosus, B. paratyphosus A. and B., B. dysenteriæ of the various types, and other micro-organisms.

As a logical consequence it is obviously of importance to determine the incidence of micro-organisms belonging to the group under consideration in the secretions and tissues of healthy individuals. If one grants that the minute organisms described are of widely varying types, one must also recognise the possibility or probability of the existence of micro-organisms of feeble or of no virulence at all which are indistinguishable by biological tests from the virulent types of "filter-passing" micro-organisms at present under consideration; the virulence of such micro-organisms to animals would not necessarily imply that they were equally virulent to human beings, nor that human beings may not have developed a relative immunity to such organisms. Such a point of view may seem ultracritical in the face of the isolation by Wilson of organisms of this type from the blood and pleuræ of cases of influenza, sites which in healthy people are recognised to be free of bacteria; but the fact is that the term "free of bacteria" refers only to those organisms which are not of this minute and special character, and the habitat of the "filter-passing" organisms under consideration is totally unknown.

(iii.) Were the cultures pure or mixed? This question has necessarily been partly dealt with under the previous question. As there is no possibility of plating out such organisms, there is not absolute certainty that pure cultures were being dealt with. All that can be said is that, supposing the filters to be reliable, only very minute micro-organisms were present in the cultures from filtered material; organisms not resistant to glycerine were excluded where glycerine was used; and further, that organisms incapable of living in complete anaerobiasis were also excluded on account of the technique adopted.

(iv.) As regards the fourth point, Wilson gives the opinion that, "as far as can be determined, these organisms are definite entities—that is, they are not stages in the life-history of a more complex organism. No evidence could be obtained that they were mere products of the breaking down of larger cocci as suggested by Rosenow." Most bacteriologists will probably agree that the onus of bringing forward proof of such a theory rests upon its promoters—that is, on Rosenow and his supporters.

(2) *The Cultural Experiments of Gibson, Bowman, and Connor.*—In reviewing the corresponding part of the work which was done by Gibson, Bowman, and Connor,[4, 7] it need only be said that the same criticisms are applicable. These workers followed closely the modification of the Noguchi technique which was used by Foster[12] in his work upon common colds. They made use of ascitic fluid in place of the inactivated serum used by Wilson, and omitted the agar bed at the bottom of the tube. The ascitic fluid was incubated for five days before being used, to ensure sterility. Sterile rabbit kidney was then added, anaerobic conditions secured by pouring liquid paraffin on the surface of the medium, and the tube, after replugging with cotton wool and capping with rubber, was allowed to stand (presumably at room temperature) for one week before being used.

Only a small amount of work in this direction was carried out by them as compared with that produced by Wilson.

In summarising this part of the work as done by Wilson, and to a lesser extent by Gibson, Bowman, and Connor, one may put the present position as follows:—Making all allowance for the possible fallacies of the technique, a convincing body of evidence has been brought forward to show that minute anaerobic organisms, possibly of one type, possibly of many groups, have been isolated from a large percentage of cases of influenza. Wilson has shown that organisms of this group may be present in pure culture in the blood and pleural effusions in a high percentage of selected cases. He has further shown that similar though probably distinct organisms are present in certain other diseases of obscure etiology. Foster had previously shown that similar organisms could be isolated from the secretions of cases of common cold. It is not at present known whether organisms of this or allied groups occur in the secreta, excreta, and tissues of healthy human beings and animals.

It is, therefore, now possible to proceed to examine the evidence so far put forward as to the etiological connection of these micro-organisms with the recent epidemics of influenza, and in so doing we may first take the animal experiments carried out by Gibson, Bowman, and Connor.

PART II.

Animal Experiments.

(1) *As carried out by Gibson, Bowman, and Connor.*[4, 7]—In their preliminary communication Gibson, Bowman, and Connor [4] give details of experiments with four rhesus monkeys, using influenzal sputum which had been filtered through a Chamberland L. 1 *bis* candle. The first two monkeys were inoculated, both subconjunctivally and intranasally with a small amount of filtrate from two cases of influenza in its early stages. The result was similar in the two experiments. In from six to seven days after inoculation both monkeys were moping, off their food, and their coats were staring. The temperature of both fluctuated, but it had already been noted of the first monkey that its temperature had been liable to fluctuation prior to the experiment. The second monkey had in addition slight diarrhœa, and seemed to be losing flesh, and its illness was regarded as being more severe than that of the first. The first monkey recovered in a few days, and as the second also showed signs of improvement, it was killed, and what is described as a hæmorrhagic exudate, affecting especially the lower lobes of both lungs, was found. This the authors regarded as being "in many respects comparable to that noted in certain human cases of influenza in which a fatal issue had supervened before the occurrence of marked secondary infection."

The remaining two monkeys, which had served as a control to the first two, were now inoculated in a similar manner with sputum obtained from a case of influenza of six days' duration. Of these, monkey No. 3 was inoculated with unfiltered sputum, monkey No. 4 with the same sputum filtered through a Chamberland L. 1 *bis* filter. These monkeys developed no symptoms of any sort.

In their second communication [7] these workers give the results of further experiments on various animals, but before their report was completely written the death of Major Graeme Gibson had taken place from an attack of the disease which he was investigating. The loss of a research worker of his ability was rendered still more calamitous by its occurrence at this particular period in an investigation of such importance as this. For although their experimental observations had reached a stage which, in the opinion of the workers, made it desirable that they should be published, it is apparent from the details that the work was only in its early stages, and the published paper itself shows evidence of hasty preparation, which renders the exact meaning in parts obscure.

Experiments with Sputum.—The experiments themselves it is not necessary to describe here in detail. With monkeys the method of inoculation described in their preliminary communication was as a

rule employed; baboons and macacus rhesus monkeys were used. Rabbits were given 1·2 c.cm. of the filtered sputum either intravenously or subcutaneously. Guinea-pigs were usually given 1 c.cm. subcutaneously, and mice 0·25 c.cm. subcutaneously, whether filtered or unfiltered material was used.

The results with ten macacus rhesus monkeys may first be examined. Of these, seven were inoculated with sputum obtained from four cases of influenza in the early stages—that is, on the second or third day of illness. In five of these filtered material was used, and in four of these five, or 80 per cent., a "positive" result was obtained. Of the other two of this series, one gave a "positive," the other a "doubtful" result. In the second series the sputum had been collected at a later stage of the attack—that is, on the fifth and sixth days of illness. One monkey inoculated with unfiltered sputum gave a "negative" result; while of the two inoculated with filtered sputum, one gave a "negative," the other a "positive" result.

It is not possible to assess a value to these experiments, because, owing apparently to an oversight, the authors have not given any definition of what is meant by the word "positive." "Negative" we can assume to mean that the animal showed no symptoms as a result of inoculation, and possibly, in addition, that after killing it and performing a post-mortem examination, no pathological lesions were found. "Positive" probably means, though this is not stated, that the animals showed a brief illness of the kind already described in the preliminary communication; whether it also includes the existence in all cases of pulmonary lesions, noted post-mortem after killing the animal, is not made clear. It is evident that a post-mortem examination was done on certain of the animals, as the condition of the lungs is definitely mentioned in two cases, and at least inferred in the others. Taking all the other factors into consideration, it is probably accurate to assume that the authors wish to convey by the word "positive" that the animals suffered a brief illness as a result of inoculation, and that, having been killed during or immediately after this illness, their lungs showed the appearance described by the authors as a hæmorrhagic exudate.

As controls, two monkeys were inoculated with sputum obtained from two cases of acute bronchitis on the third day of illness, with a negative result. It is not possible to refrain from expressing surprise at the nature of the controls which were selected during an epidemic of influenza which showed bronchitic complications as a marked feature of such a large percentage of cases. As a third control is mentioned a monkey which died two days after arrival with a lobar pneumonia associated with M'Gowan's bacillus of distemper; of this animal it is noted that the post-mortem findings were totally different from those seen in the experimental animals.

Two rabbits, four guinea-pigs, and fourteen mice were also inoculated in various ways, and results similar to those obtained with monkeys were obtained. That is, speaking broadly, filtered sputum derived from cases of influenza in the early stages gave in most cases a "positive" result; the same material derived from cases of influenza in the later stages gave a "negative" result. The controls inoculated with filtered sputum from apparently the same case of acute bronchitis described above also gave a negative result.

Experiments with Blood.—Certain experiments were then carried out with the blood obtained from influenza cases. One monkey inoculated with 5 c.c. of whole blood showed no effect; it was killed seven days later, and both macroscopically and microscopically gave a completely negative result; the other, inoculated subconjunctivally and intranasally with small amounts of filtered blood from the same case, was "moping" five days later, and was killed on the seventh day. At post-mortem examination the lungs appeared quite normal macroscopically, but microscopically some capillary congestion with definite small patches of inflammatory change was found.

A number of mice were inoculated subcutaneously with 1 c.c. of blood from influenza cases in their early stages. The result was in the majority of cases death, and in most of these fatal cases, and also in some non-fatal cases, the lungs of the mice showed hæmorrhagic patches or inflammatory changes of varying degree. It is to be noted that the blood used in these cases was whole and not filtered, and that it is not mentioned that the presence of the micro-organisms, such as streptococci, was excluded. There is, therefore, no certainty that the effect in these cases was due to the minute bacteria in question. Two control mice were inoculated with normal blood and showed no effect.

It will be seen that no very positive information was derived from these experiments with blood.

The authors next deal with the question of the passage of the virus from animal to animal. The importance of this side of the question is obvious; it was necessary to show that these effects were due to a living virus, and not produced merely by the introduction of a toxin-laden secretion or tissue, or even by the simple inoculation of foreign organic matter.

Passage was attempted in one series of animals by means of filtered sputum, rabbits and guinea-pigs being used. For details the original paper must be referred to; it is sufficient to say that proof that a living virus was passed from animal to animal was lacking, although it must be made clear that this is not the conclusion arrived at by the authors.

More interesting results were obtained in a series where a culture of the micro-organism was used. A rabbit inoculated with it showed no symptoms, and, when killed and examined post-mortem, showed no

change in the lungs; from its kidney, however, the authors were able to obtain a further growth in a Noguchi tube. Unfortunately, instead of testing this growth by means of inoculating it to other animals, the authors, as far as can be made out from the text, now mixed this growth with subcultures of the original growth, and therefore virtually began the experiment over again. This mixture was now inoculated to a baboon which gave a "positive" result; and filtered lung extract from this animal being inoculated into a rabbit again gave a "positive" result; from this rabbit once more filtered lung extract produced a "positive" result in another rabbit.

A successful culture was made from the kidney of this baboon.

In reviewing these experiments certain questions may be put.

(i.) Have the authors been successful in producing influenza in animals by means of filtered material from human cases?

(ii.) Have they been able to produce influenza in animals by means of cultures of this "filter-passing" virus?

(iii.) Have they proved that the lesions produced in animals were due to a living virus?

(i.) In dealing with the first of these questions, it may at once be pointed out that absolute proof of the conveyance of influenza to lower animals can scarcely at the present time be brought. The authors have been able to produce in lower animals a pulmonary condition which resembles that seen in the early stages of influenza, but it is certain that pure cultures of other micro-organisms, some of which are quite definitely clear of any suspicion of being the initiating cause of influenza, are able to produce in animals pulmonary lesions resembling those described by the authors as typical of "experimental influenza." Apart from organisms which have a selective effect upon lower animals, many strains of pneumococci and streptococci, for example, are capable of producing in the lungs of mice changes similar to those described. A more specific effect than that described by the authors is therefore necessary before it can be accepted that they were able to transmit the disease to lower animals, assuming that it is capable of such transmission.

As to questions (ii.) and (iii.), a greater bulk of evidence is available from the experimental work of Bradford, Bashford, and Wilson, to which we can now turn.

(2) *The Experiments of Bashford.*—The experimental work carried out by Bashford is reported in detail in the April number of the *Quarterly Journal of Medicine*,[8] and also briefly in the *British Medical Journal*.[9] Monkeys, rabbits, and guinea-pigs were used, and a total number of forty-one inoculations were made. These experiments have a particular interest and value in that they were nearly all carried out, not with filtrates of sputum or blood, but with living cultures which had been isolated by Wilson from cases of influenza. From every one

of these experimental cases the organism was recovered in culture by Wilson.

In the experimental animals the clinical symptons were noted, and it is of importance that a marked feature of the cases was the development of running at the nose, suffusion of conjunctivæ, sneezing, and other signs of nasal irritation; sometimes in severe cases laboured breathing was observed and râles heard. Post-mortem examinations were carried out on certain of the animals, and in all of these pulmonary conditions were found resembling those noted by Gibson, Bowman, and Connor. An inflammation of the kidney was observed post-mortem in certain of the cases, and this led to careful clinical observation of a monkey which had been inoculated with a culture. Examination of the urine showed after a time the presence of albumen and finally of casts. In this particular also, a parallel between the experimental disease and some of the cases of influenza in human beings may be drawn.

In addition, in the experimental animals other lesions were noted which included fatty changes in heart and liver, hæmorrhages in voluntary and cardiac muscle, and cerebral lesions; these were regarded as being similar to the lesions present in human cases.

A series of passage experiments was then attempted, using a living culture for the primary inoculum, and although these experiments require extension and amplification, a certain amount of evidence of increase of virulence was produced.

In applying therefore the latter two questions of the three which were put to the experiments of Gibson, Bowman, and Connor, the following deductions may be made:—

(ii.) This worker has been able to produce in animals by means of cultures of this filter-passing virus a condition which resembles influenza (and also, we may remark in parenthesis, distemper) in its clinical symptoms, and which is accompanied by certain pathological lesions which resemble those found in human cases of influenza. He has thus been able to produce by these experiments probably as great a degree of proof that the filter-passing virus is the cause of influenza, as it is possible at the present time to produce by the use of lower animals in the study of this disease.

(iii.) He has proved that a living virus and the toxins of this virus were the cause of the condition produced in animals.

PART III.

Experiments upon Human Beings.

In addition to the preliminary experiments of Nicolle and Lebailly already referred to, two pieces of work in which human beings were used for experiment have already been carried out.

(1) *The Experiments of Friedberger and Konitzer.*[10]—We have not

been able to obtain the original of this communication, and have made use of the abstract published in the Reviews of Foreign Medical Literature furnished by the Medical Research Committee.

These workers used filtered secretion from influenza cases for the inoculation of human beings, Berkefeld filters being used. In all thirty-five experiments were made with completely negative results. Not one of the inoculated subjects developed any symptoms of this disease.

(2) *The Experiments of Yamanouchi, Sakakami, and Iwashima.*[11]—Directly opposing results have been obtained by the other set of investigators, working in Japan, an abstract of whose report has recently been published. These workers did not cultivate the virus, but used influenzal blood and emulsion of influenzal sputum for the inoculation of human volunteers. An unfiltered emulsion of the sputum of forty-three patients was injected into the nose and throat of twelve healthy persons; a filtrate (by Berkefeld filter) of the same emulsion was injected into the nose and throat of twelve other healthy persons; a filtrate of the blood of influenza patients was injected into the nose and throat of six other healthy persons; the filtered sputum was inoculated subcutaneously to four other healthy individuals, and the filtered blood subcutaneously to yet four other healthy persons.

All these persons, with the exception of seven, developed influenza of varying degrees of severity after two or three days' incubation period; the seven exceptions had all had a previous attack of the disease.

A pure culture of Pfeiffer's bacillus, and a mixed preparation of the Pfeiffer's bacillus diplococci, along with pneumococci, streptococci, staphylococci, diplocci, and many other like microbes common in the sputa of influenza patients were injected into the throat and nose of fourteen healthy people who had not had influenza. There were no symptoms of illness following these injections.

These latter fourteen people may therefore be regarded as controls to those inoculated with the other material, as far as the passage of infection by means other than inoculation is concerned.

The results of the Japanese workers appear to be strikingly confirmatory of the work done in France, and, at first sight, strangely at variance with the results of the German experiments. It is possible that the discrepancy is due to a very simple cause. The Japanese workers were using Berkefeld candles of types not stated, and it is probable that these were sufficiently large-pored to allow through the small organisms in question. Possibly the filters used by the Germans were of finer calibre, although of the same variety. Wilson has noted that the two Berkefeld filters used by him allowed micro-organisms up to 0·5 of a micron to pass through, while one of the Massen filters tested kept back all organisms of 0·1 microns or over.

It is obvious that a standardisation of filtration method, by careful gauging of filters, and by a uniformity of time for filtration and of pressure used, is required. The term "filterable" virus or "filter-passing" virus is at the present time one which conveys a wrong impression of uniformity in the size of such organisms.

It is to be hoped that some of the workers who have had experience with the cultivation of the virus may be able to continue the experiments upon human beings, using cultures rather than filtered material, so that it can with certainty be known that the toxins present in the inoculum are derived from the organisms under consideration and from them alone.

Conclusion.

The evidence in favour of the minute anaerobic organisms in question being the cause of influenza is accumulating each month. The work published by Bradford, Bashford, and Wilson, with the confirmatory evidence supplied by Gibson, Bowman, and Connor, has proved beyond doubt the presence in cases of influenza of the minute anaerobic organism or group of organisms described, and the power of this organism to produce certain pathogenic effects in animals.

Yamanouchi, Sakakami, and Iwashima, have furnished a mass of evidence confirmatory of Nicolle and Lebailly's original observation that filtered material from influenza cases is capable of producing an influenza-like condition in human beings, provided the filter used is not too fine pored.

The determining of the incidence of micro-organisms of this group in healthy human beings, and, above all, the crucial test of inoculation of human volunteers with living cultures, still require to be carried out.

References.—[1] Nicolle and Lebailly, *C. R. Acad. Sci.*, p. 607. [2] Nicolle and Lebailly, *Presse médicale*, 17th October 1918. [3] Nicolle and Lebailly, *Brit. Med. Journ.*, 2nd November 1918. [4] Gibson, Bowman, and Connor, *Brit. Med. Journ.*, 14th December 1918. [5] Bradford, Bashford, and Wilson (separate articles), *Quart. Journ. Med.*, vol. xii., Nos. 45 and 46, October 1918 and January 1919. [6] Bradford, Bashford, and Wilson, *Lancet*, 1st February 1919. [7] Gibson, Bowman, and Connor, *Brit. Med. Journ.*, 22nd March 1919. [8] Bradford, Bashford, and Wilson, *Quart. Journ. Med.*, vol. xii., No. 47, April 1919. [9] Bradford, Bashford, and Wilson (separate articles), *Brit. Med. Journ.*, 17th May 1919. [10] Friedberger and Konitzer, *Med. Klin.*, *Berl. u. Wien*, Bd. xv., 108, 1919. [11] Yamanouchi, Sakakami, and Iwashima, *Lancet*, 7th June 1919. [12] Foster, *Journ. Inf. Dis.*, vol. xxi., No. 5, November 1917. [13] Noguchi, *Journ. Exper. Med.*, vol. xiv., 1911. [14] Flexner and Noguchi, *Journ. Exper. Med.*, vol. xviii., 461, 1913.

THE CARE OF PREGNANCIES AND LABOURS DURING THE WAR.

By J. W. BALLANTYNE, M.D.

It has been a noteworthy fact that during the progress of the Great War almost the only legislation in this country which was not the direct outcome of the conditions due to hostilities was concerned with the welfare of infants, unborn and recently born. It will be an interesting study in the future to look back over these days which are still fresh in the memory of all, and to pick out the enactments, such as the Notification of Births (Extension) Act and the Midwives Act for Scotland, from their strange setting of recruiting and conscription and War Loan measures, and reconstruct the purpose of Parliament and the needs of the time from them. The appalling loss of young adult life was one of the impressive phenomena of the war; the falling birth-rate, even before the war, had begun to cause forebodings in many minds as to the future of the cultured European nations and of the Anglo-Saxon stock; and the rush of women into unaccustomed work, including munition factories, following upon the war, had raised in an acute form a difficulty already existing, namely, the supervision and protection of the young infants of such women. Doubtless other factors entered in; but certainly these three conditions had their effect upon the legislature and made the Government willing, and indeed anxious, to do everything to preserve young lives and to carry back the care of these lives into the ante-natal period—that is to say, to watch over pregnancies not only for the mothers' but also for the children's sakes. So the Acts of Parliament were pushed through, the Houses showing a degree of beneficent or of wise prevision which was, perhaps, as unexpected as it was welcome. "Baby Week," as it was and is called, became an annual great event in London and in some other large towns.

What happened in this country was pretty well known, and what went on in France was soon made public, and was indeed commented upon in several summaries published in this *Journal* (viz. in the parts for June 1916, p. 465; for June 1917, p. 450; and for September 1917, p. 193); but of what was going on in Germany only supposition, some of it wild enough, was possible outside of official circles. The veil has now been lifted, and in a report entitled *The Welfare of the Children of Women employed in Factories in France and Germany*, prepared by the Intelligence Department of the Local Government Board (1919), not only is there a synopsis of what most of us knew was being done on the other side of the Channel, but there is also authoritative information regarding what was being carried out beyond the Rhine.

Up to the time of the outbreak of war, women workers in Germany were under legal protection. By the Imperial Industrial Law women

workers in factories were forbidden to work on night shifts, their working day was limited to ten hours, and they could not be employed for a fortnight before or for six weeks after confinement. Further, certain kinds of heavy work were forbidden to them altogether, such as employment in coke works or in the transport of building materials. When war was declared, no time was lost in altering all this. An Emergency Law of the 4th August 1914 gave the Imperial Chancellor power to suspend, in regard to particular districts or industries, some of the provisions of the Industrial Law. The sections intended to protect women workers were among the provisions which could be suspended. The Chancellor's power of exemption from the Industrial Law practically came to be delegated to the Government officials in each military district, with results which were soon apparent. The working conditions of women in factories of all kinds were at once seriously affected. Exemptions from the protective enactments were freely given, generally without much, if any, inquiry as to their necessity, and without any limitation of time. Presumably, all the weight of the country was to be thrown into the war in its first phase, which was meant to be decisive. "Long hours, night shifts, heavy and unsuitable work became general, *and rest before and after confinement was not enforced.*" A significant statement was made by the Federation of Trades' Unions in 1916, that women were even being kept at work in the factories in Upper Silesia for twenty-four hours at a stretch, with only a few brief intervals; and that in the mines they had been required on occasions to work for three shifts (thirty-six hours) without a proper rest. Complaints soon gathered force, and representations were made to the Government regarding the harm being done to the women, and the danger involved to the coming generation. In the beginning of 1916 the organised women in the trades' unions petitioned for the repeal of the Emergency Law, for the revival of the protective enactments, for an eight-hour day for women, etc.; and the trades' unions themselves, without demanding repeal of the law, asked that the working hours of women should be restricted to eight as a rule, and should be no more than ten in exceptional cases. In the next year (1917) in the month of February, the Greater Berlin War Committee for the Care of the Children of Working Mothers addressed a memorial to the Imperial Ministry of the Interior, asking for the reintroduction of protective measures for women workers who had children under one year old, and *for expectant mothers.* In April of the same year (1917) the Repopulation Committee of the Reichstag made recommendations to the Imperial Chancellor that women workers should not be employed for more than eight hours at a time in factories where the work was carried on day and night, and not more than ten hours in other cases, that they should have complete rest every other Sunday at least, that ten weeks' rest should be given at confinement,

with a corresponding extension of the Imperial maternity grant, etc. As a result of these recommendations and of the effect observable in the health of women workers, official action was taken to some extent, and exemptions under the Emergency Law of 1914 were strictly scrutinised and greatly limited. A most important order issued by the Imperial Government in July and August 1917 was to the effect that the provisions of the Industrial Law designed to protect expectant and nursing mothers should be strictly observed. Further, the Imperial Chancellor addressed a circular to the Federal Governments, urging that factory inspectors and other officials should see to it that expectant and nursing mothers should not be employed on night work or overtime, and that no woman should be placed on twenty-four hour or similar long shifts. Even before the war the question had been raised whether mothers of young children should be employed in factories at all; and during the war prominent infant welfare workers urged that it would be better to give mothers sufficient help during the first three months after the birth of a child to enable them to stay at home and breast-feed and look after their infants, than to allow them to return to their work in the factory while their infants were cared for by others.

Imperial maternity grants in Germany were first regulated by a law of December 1914. It was fixed that they were to be given, through the sickness societies, to all insured, and therefore to all industrially employed, women. They consisted of, first, a single payment of 25s. towards the expenses of confinement; second, of an allowance formerly of 1s., now of 1s. 6d., daily for eight weeks, at least six of which must be after the confinement; third, of an allowance of 10s. for medical attendance during pregnancy, if needed; and, fourth, of an allowance for breast-feeding, at the rate of 6d. a day, for twelve weeks after confinement.

There was, therefore, in Germany, as in France, a distinct tendency during the war for the State to aid both confinements and the pregnant condition in a degree which had not been done before. That this would have come about if there had been no war is very likely, in fact, almost certain, for the fall in the birth-rate would have done it independently of anything else, but it would not have come so quickly. It is noteworthy that in Germany much less is said about the care of the mother before the birth of her child than in France; and the Imperial grant, although allowing a small sum for medical advice in pregnancy, with the significant words "if required" attached to it, has no elasticity in this direction. Indeed, the language used throws the emphasis upon post-natal rather than upon ante-natal aid to mothers.

In association with what has appeared about Germany in the above report may be taken Dr. C. Döring's estimate of the loss of infantile

life in that country during the war. Dr. Döring of Copenhagen has written a report in Bulletin No. 4 of the *Studiengesellschaft für sociale Folgen des Krieges* (1919) upon such information as was available to him, and he points out that from April 1915 the birth-rate in Germany was adversely affected by the war. Within the first year, counting from the above date, the births were from 21 to 24 per cent. fewer than in the last year before the war, although, of course, one may allow that some of this descent would have occurred if peace had continued. He puts the accumulated deficit of births by the end of the war at the huge total of three and a half millions. To these have to be added the deaths of infants and young children caused by poor nourishment during the five years 1914–19. There can be no doubt that war is destructive to infantile lives, probably as much so as to young adults, although its mode of action differs.

It needs no strong prophetic vision to foresee that in the immediate future there will be a great campaign undertaken in all the countries most grievously affected by the war to save young lives. In Germany and in France such a campaign is pressingly needed, and will be pushed on; and, to judge from recent indications, it will be no less earnestly carried on in Britain and America. It will have not only to make up losses in infantile life, it will also be called on to compensate for a steadily decreasing birth-rate, for no one save a super-optimist believes that the cessation of war will check that fall. There are already signs that one of the first plans adopted will be the provision of small maternity hospitals in many towns now without such institutions; in private practice, also, the maternity nursing-home will grow in popularity. There will be a further growth in the number of women training for the diploma of the Central Midwives Board. The maternal aspect of child welfare schemes may likewise be trusted to develop more than it has yet done, the tendency being to carry preventive measures back before birth, and to try to check miscarriages and still-births. In America, to judge from some discussions there during the war, the tendency may be to discourage midwives' practice and replace it, where possible, by the aid of the qualified medical woman or man. There are still many lives lost immediately after birth which might well be saved, and thousands perish in the womb or as abortions which an enlightened care for pregnant women would almost certainly rescue.

VISUAL ORIENTATION AND CERTAIN CASES IN WHICH IT WAS DISTURBED.

By W. G. SYM, M.D.

Among the less obvious, but still highly important, functions connected with vision a valuable one is visual orientation, or the power of deter-

mining, by our visual powers alone and unaided by other faculties, the situation in space of a given object and its distance from the observer. If one thinks of it, this must be a very valuable power with which we are endowed: the estimation of the relative position in space of objects seen is an extremely useful accompaniment of vision. There is not much literature on the subject, because, for one thing, cases of loss or abnormality of the power are not very frequently observed; and when they do occur, it is apt to be in a patient whose mental incapacity is such as to render examination well-nigh nugatory, or who is, at all events, the subject of too widespread cerebral degeneration to permit of satisfactory examination.

One of the medical results of the war, however, has been to give rise to the occurrence of some examples in young and healthy subjects; Holmes has recorded several, and has discussed them with much care.

In the first of his cases, whose symptoms in most respects were fairly typical of all, the salient features were that, though central vision was perfect and the fields very nearly so, he was unable to maintain his "visual attention." If an object was held up before him, and he was invited to look at it, though he could see it and recognise it, he was unable to direct the gaze towards it, sometimes looking quite in the wrong direction and vacantly gazing. (A superficial observer might easily have been misled into thinking that this was "put on.") Though there was no ocular paralysis, he would fail to keep the eyes upon a moving object; and sometimes could not, when desired to do so, direct the eyes in any particular line, or even look at his own hand, though there was no inco-ordination (of the more ordinary type) present. If he were asked to catch hold of a pencil, for example, which was held up, he would throw the hand in a wrong direction, or past the object, or grope for it, or grasp "short" of it. If he could get the object into the area of central fixation, he could usually touch it, but it might be only after several futile and apparently purposeless efforts that he did get the eyes turned upon it, as it were, by a fortunate accident. He never blinked when "threatened" with an object suddenly brought in front of the eyes; and when an object was thus gradually brought near the pupils did not contract.

Two objects near to him, but one decidedly nearer than the other, confused him greatly; he could not tell which was the nearer, and complained that whichever he looked at seemed to move farther and farther off. He was quite unable to count a few coins or similar articles widely spaced upon a board; he would find one or two which were close to the fixation spot, but could not discover the others. When walking, he frequently "bumped into" objects, even though he had seen and pointed to them before starting on a journey across a room; and he would knock himself against a wall, yet his gait was not ataxic. He was much less of an adept at finding his way to a certain

spot—say, to his own bed, when half-a-dozen yards away, and he had seen it and pointed to it—than a blindfolded man or a blind man would have been.

Thus it is seen that his visual symptoms fall into two groups: inability to direct the eyes in a required direction, and disturbance in localisation of vision.

If one is entitled to assume that the missile which had injured his head (a spherical shrapnel ball) passed direct from the wound of entrance to the spot from which it was removed, then the track led from the upper posterior part of the supramarginal gyrus on the right side, through the dorsal part of the right hemisphere, perforated the falx dorsale to and in front of the posterior margin of the splenium of the corpus callosum, passed in front of the knee of the optic radiations on the left side, and so to the left supramarginal gyrus at the inferior part in front of the posterior end of the Sylvian fissure.

These are, in brief, the symptoms exhibited by the first of the six patients whose cases are dealt with by Holmes; and as they have been described in so much detail (though in reality a mere *résumé* of Holmes's delightfully clear and full record of the tests applied and the results obtained), it will not be necessary to dwell upon the others. In the main they were alike, the functional disturbances varying in degree rather than in kind, though in some details they were not quite the same.

The first essential distinction between them all on the one hand and ordinary cases on the other is that the symptoms were not such as we see in cases of loss of even large parts of the field of vision. An ordinary patient with hemianopsia may knock up against objects on his blind side, but he has not the slightest difficulty or uncertainty regarding those which are within his retained field; but the patients with whom we are dealing in this paper failed to avoid obstacles which they had seen perfectly well, failed to be able to direct the gaze upon an object seen with the more peripheral parts of the retina, could not count even the pips on a card—in a word, showed interference with spatial orientation. Each of them failed to touch accurately any object within his reach and vision, though muscular action was intact; in walking he collided with objects which were easily visible; he was unable to walk round them; frequently he could not recognise their relative positions in space, making mistakes in all three planes. It is evident that retinal response to stimulus—the primary element in the estimation of position—can instruct us regarding two dimensions only; for the third we require to obtain evidence from the ocular (and sometimes from other) muscles. The retina alone, it is true, can give us some information even regarding distance, provided the size of the object seen is already more or less familiar to us. It was in this incapacity of estimating distance that Holmes considers these patients'

inability to walk without collision chiefly lay. They all tended to over estimate the distance at which a tangible object lay; no doubt this was largely produced by their failure to accommodate correctly for near objects. In the fact that the patients' difficulty in reading, though considerable, was less notable than their inability to count several coins placed discretely over a small table or plate, Holmes sees the influence of training of the ocular motions in a succession of movements in one direction; such habitual movements would naturally be less hampered than the more definitely volitional direction and re-direction in searching the surface of a card, for example, for the pips upon it. In all the patients this failure to direct was an important element—perhaps the most important; but another, present in some of them, was an apparent "lack of visual attention": an object within the field of vision was not necessarily consciously seen; sometimes the patient was not aware of its presence though, in a sense, he saw it all the time.

There were some interesting differences among the patients. One could turn his eyes promptly and correctly to his own hand, but some others were not able to do this or to turn the eyes to some part of their own bodies which was touched with a finger. This shows, says Holmes, that in them the central innervation of the eye muscles had suffered directly, and that the affection of fixation was not due solely to perceptual disturbances. A further point of interest was that some of the patients were unable to accommodate and converge for an object even when they knew that it was quite near. Since in these cases the angular gyrus was wounded, Holmes considers it probable that this part of the brain contains, in addition to the centre for ocular movements, the apparatus for the reflex adjustments to external stimuli—the co-ordination of the afferent impulses received from the retina.

To go over in detail the precise positions of the structures injured would make this review far too long, even although this could with certainty be determined in one or two only of the cases; but two features stand strongly out in them all: namely, first, that in all cases both hemispheres of the brain were wounded (and these symptoms have not been recorded as occurring in any case of unilateral injury); and second, in all cases the lesions on the lateral surface of the hemispheres lay in a region which included in its centre the angular and supramarginal gyri and extended into the adjoining temporal, occipital, and parietal convolutions.

Reference.—Holmes, *British Journal of Ophthalmology*, 1918.

REPORTS OF SOCIETIES.

THE SCOTTISH OTOLOGICAL AND LARYNGOLOGICAL SOCIETY.

THE Society met for the first time since June 1914 in the Royal Infirmary, Edinburgh, on 14th June 1919. Dr. W. T. Gardiner was elected President, and Dr. W. S. Syme was re-elected Secretary and Treasurer.

Dr. Peter M'Bride was elected the first Honorary Member.

A short discussion on the prevention of chronic ear disease was opened by Dr. A. Logan Turner, who submitted statistics from civil and military hospital practice showing the prevalence of chronic middle-ear suppuration; and Dr. W. T. Gardiner supplied tables giving a death-rate from intracranial complications of middle-ear disease of 1·6 per cent. of all deaths occurring in the Edinburgh Royal Infirmary over a period of ten years. A committee was appointed to sift the facts as to the prevalence of the disease, to consider the best means for its prevention, and to lay the views of the Society before the new Ministry of Health for Scotland.

Dr. W. T. Gardiner reported two cases of epistaxis, which had come under his care in Palestine, due to the presence of a leech in the nasopharynx.

Dr. A. Logan Turner showed one case, and reported another, of removal of malignant disease of the post-cricoid portion of the pharnyx by Mr. Graham. In both there has been no recurrence. He also showed preparations and drawings illustrating the condition, and submitted tables giving the sex- and age-incidence of squamous epithelioma of the fauces, tongue, pharynx, larynx, post-cricoid region, and œsophagus. While the tables are full of interest, perhaps the most interesting fact is the great excess of females over males (5 : 1) in the cases of post-cricoid carcinoma, and of the early age at which it shows itself. Dr. Turner also showed a patient, a female, with an unusual tumour of the larynx, probably non-malignant; and another woman with motor and sensory paralysis affecting parts of the palate, pharynx, and larynx, associated with nystagmus and giddiness.

Dr. J. S. Fraser showed two patients, a female and a male, operated on —the former two years ago, the latter five months ago—by thyrotomy for intrinsic cancer of the larynx; also a woman whose larynx he removed three years ago. He also reported another case, a male, who died after laryngectomy performed for recurrence subsequent to thyrotomy. Dr. Fraser also showed: (1) a man whose right frontal sinus he had opened for acute right frontal sinusitis associated with what was possibly meningitis interna hæmorrhagica; (2) two patients operated

on for malignant disease of the ear; (3) two patients in whom ethmoidal disease was associated with orbital complications; and (4) an interesting case of congenital defect of the right ear, probably of the cochlea.

Dr J. K. Milne Dickie demonstrated, by means of a reconstruction model, some points in the minute anatomy of the membranous structures of the ear—relative sizes of the saccule and utricle, presence of crista quarta, size and shape of ampullæ, ductus reuniens, and ductus utriculo-sacculari s.

Dr. D. Guthrie showed: (1) specimens of choanal polypi from two children, and nasal and choanal polypi removed post mortem from a chimpanzee; and (2) the larynx of a chimpanzee showing large ventricle.

ANALYTICAL REPORTS.

The "Dux" Electric Quilt.

(Hall & Co., Wigan.)

We have received from the manufacturers a specimen of their "Dux" electric quilt, and have taken the opportunity of testing its usefulness in hospital cases. The quilt supplied to us measures about 4 ft. by 3 ft., and has a removable cover which can be washed. It is quite light in weight, and perfectly soft and flexible. We find that when a patient is wrapped in or covered by the quilt, and a blanket and coverlet placed over all, a temperature of 100° F. is attained in about a quarter of an hour, and is maintained so long as the current is turned on. There are many obvious uses to which such an appliance may be put. We have found it an excellent means of maintaining the action of the skin in patients with nephritis after a hot pack, and it has also proved useful in cases of post-operative shock and collapse from acute diarrhœa. The quilt consumes little current; it is adapted for a supply at 115 volts; if the voltage is higher, a simple resistance can be obtained from the makers. It can be connected to any wall-plug or lamp-holder. The price is not stated, but is said to be moderate. The quilt will be found of value in many cases of illness; in fact, as a labour-saving device it ought to form part of the equipment of every hospital ward.

Genasprin (Acetyl-Salicylic Acid).

(Genatosan Ltd.)

The British firm of manufacturing chemists, Messrs Genatosan Ltd., since they acquired, in 1917, certain important undertakings previously owned in Germany, have continued to develop their business on progressive scientific lines, particularly in the direction of utilising the advances that have been made in synthetic chemistry to improve the quality of therapeutic agents.

One of their most recent products, genasprin, has recently been submitted to us, and we can confirm the claims that are made for it as a chemically pure form of acetyl-salicylic acid which contains no irritant free acids or other deleterious impurities.

NOTES ON BOOKS.

The War Work of the Y.M.C.A. in Egypt, by James W. Barrett, K.B.E., C.B., C.M.G., M.D., etc. (Lewis & Co., price 10s. 6d. net), is furnished with a preface by General Sir E. H. Allenby, and gives a most interesting account of the magnificent work accomplished during the war by the Y.M.C.A. in Egypt. Starting with scanty material resources in 1914, there quickly developed a vast organisation ministering to the moral, mental, and physical needs of the troops in Gallipoli, in the Delta, in the Libyan Desert, in Sinai, and in Palestine. The manner in which the work was accomplished, notwithstanding immense difficulties of climate and of transport, is related by the author, who is eminently qualified to do so by his intimate association with the development of the work and by his literary attainments. To the medical profession one of the most interesting chapters is that on physical education, with every exercise performed to music. The book contains excellent illustrations of soldiers' clubs, hostels, and swimming baths established in Cairo, Jaffa, and Jerusalem, as well as of Y.M.C.A. marquees on the desert and of dug-outs in the front line. In the preface Sir Edmund Allenby writes, the book is "of absorbing interest, and the reader is filled with admiration and gratitude towards the organisers and administrators of this vast undertaking."

Ambulance de l'Océan, by Dr. A. Depage (H. K. Lewis & Co., price 14s.), is a continuation of the publication descriptive of surgical work carried out at the Belgian Hospital situated at La Panne. As in the other volumes, it contains a summary of the work which has been done in a number of surgical departments. There are interesting articles by Depage on the examination of war wounds and the treatment of wounds of the feet. There is an excellent article by Dr. Newman on the treatment of wounds of the abdomen; but we are rather surprised to find that in his summary of post-operative treatment he recommends the intravenous injection of physiological serum. Recent experience has gone to show that this method is by no means devoid of danger, from the point of view of anaphylaxis. His figures show a proportion of 25 per cent. cures. In the posts which were instituted in the medical service of the French and British Armies, a higher proportion of recoveries has been recorded. In the volume under review the more purely scientific side of war surgery is also dealt with, and an interesting account is given by Drs. Relraz and Govaerts on the mechanism by which organisms introduced into the system are eliminated from the body. The volume is one which will repay reading by those who are interested in war surgery.

Lenzmann's Manual of Emergencies, by J. Snowman, M.D., M.R.C.P., Lond. (John Bale, Sons & Danielsson, Ltd., price 15s. net) is based

on the English edition of Lenzmann's *Emergencies* which appeared in 1914, and deals with the diagnosis, pathology, and treatment of those morbid conditions which may suddenly endanger life, so that emergencies such as fractures or dislocations, in which the risk to life is not involved, are necessarily excluded.

The different systems are taken up seriatim, and the emergencies treated in detail, succinctly and clearly, so that one can carry away a definite idea of the nature of the emergency and the steps necessary to cope with it. There is a particularly interesting chapter on acute poisoning, which embraces a section on serum poisoning and anaphylaxis. The author gives the reader some very important indications by means of which he may be able to protect his patients from accidents that may arise owing to neglecting to take anaphylactic processes into consideration.

Midwifery also is included, with chapters on the hæmorrhages of pregnancy and on extra-uterine gestation, as well as the usual emergencies associated with full-time pregnancy and labour.

We notice, with great satisfaction, that the numerous drugs of German origin which were so freely recommended in the original translation are here passed over, and quite as useful preparations with a B.P. recommendation are substituted.

The whole book is an excellent epitome of the original, but to be of use it must be digested like a text-book, as one has no time to go home and consult authorities when faced with an emergency where a patient's life or death depends upon immediate and appropriate treatment.

BOOKS RECEIVED.

ALLEN, R. W. Practical Vaccine Treatment . . . (*H. K. Lewis & Co., Ltd.*) 7s. 6d.
BERKELEY, COMYNS, Under the direction of. Diseases of Women . (*Edward Arnold*) 30s.
BREND, WM. A. Handbook of Medical Jurisprudence and Toxicology. Third Edition (*Charles Griffin & Co., Ltd.*) 10s. 6d.
BYAM, W., and Others. Trench Fever . . (*Henry Frowde and Hodder & Stoughton*) 10s. 6d.
FLEMING, R. A. A Short Practice of Medicine. Third Edition . (*J. & A. Churchill*) 21s.
HARTRIDGE, GUSTAVUS. The Ophthalmoscope. Sixth Edition . (*J. & A. Churchill*) 6s. 6d.
HURRY, JAMIESON B. Vicious Circles in Disease. Third Edition (*J. & A. Churchill*) 15s.
HURST, A. F. Constipation and Allied Intestinal Disorders. Second Edition (*Henry Frowde and Hodder & Stoughton*) 16s.
LUCAS, E. W., and H. B. STEVENS. First Lines in Dispensing. Second Edition (*J. & A. Churchill*) 6s.
MAKINS, G. H. On Gunshot Injuries to the Blood-Vessels (*John Wright & Sons, Ltd.*) 21s.
MARR, H. C. Psychoses of the War . . (*Henry Frowde and Hodder & Stoughton*) 16s.
OSTROM, K. W. Massage and the Original Swedish Movements. Eighth Edition (*H. K. Lewis & Co., Ltd.*) 5s.
SMITH, W. JOHNSON, Revised by Arnold Chaplin. Shipmasters' Medical and Surgical Help. Fifth Edition . . . . . (*Charles Griffin & Co., Ltd.*) 6s.
WEBER, HERMANN. On Longevity and Means for the Prolongation of Life. Fifth Edition (*Macmillan & Co.*) 12s.
WHITMAN, ROYAL. Orthopædic Surgery. Sixth Edition . . . (*Henry Kimpton*) 36s.
WILSON, R. M., and JOHN H. CARROLL. The Nervous Heart (*Henry Frowde and Hodder & Stoughton*) 6s.

EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

H.R.H. The Prince of Wales has been graciously pleased to accept the Honorary Fellowship of the Royal College of Physicians of Edinburgh.

The Reorganisation of the Medical Services.

The establishment of the Ministry of Health and the formation of the Medical Boards brings the question of the reorganisation of the mechanism of medical service into the forefront of practical politics. The matter has already received consideration from various bodies, and different schemes have been adumbrated and discussed. We have received a memorandum, drawn up by the Advisory Committee on Public Health of the Labour Party, which brings clearly before us the views of that section of public opinion on the subject. The Committee, which was presided over by the Rt. Hon. John Hodge, M.P., consisted of twenty-five members, of whom more than half were doctors. Without expressing any opinion as to the merits of the Committee's recommendations, we bring them to the notice of our readers as an obviously sincere constructive contribution to the subject. If they do not always solve problems, they at least raise them, and the medical profession will sooner or later have to give them their close attention.

The title of the Report, *The Organisation of the Preventative and Curative Medical Services and Hospital and Laboratory Systems under a Ministry of Health*, suggests the point of view from which the Committee have taken up the subject.

Following the present-day tendency, they place the preventive function of medical science before the curative, and they even go further and look to medicine "for the inauguration of those systems of living, working, and enjoying leisure which experience and scientific research show to be capable of producing the greatest happiness for all."

It is pointed out that while infant mortality has been greatly

lowered by educational means in the last decades, nothing comparable has been done to extend the average expectation of life of adults. "The instruction of medical students in preventive medicine is very inadequate . . . the clinical teachers . . . know but little of, and have failed to protest against, industrial and housing conditions . . . and the general practitioner has little opportunity to study and uphold the principles of preventive medicine." These defects, the Committee claim, urgently call for improvements.

Under existing conditions, so much of the practitioner's time is spent on the *art* of medicine that too little remains for acquiring and practising the *science* of medicine. "Thus the poor who go to a hospital with a medical school often secure a more accurate diagnosis and more skilled treatment than the patients of a private doctor."

With regard to a State Service, the Committee postulate that it "should be under democratic control"—it "must not be bureaucratic," and "there must be nothing in the scheme to take away the choice of doctor from the patient, but rather to widen and amplify that very restricted choice he now possesses. . . . It must not prevent private practice, and no practitioner or patient must be forced to take any part or share in it against his desire."

It is proposed that the country should be divided into areas of sufficient size to allow of complete medical organisation, and that the hospital of each area, with its fully equipped laboratories, should be the headquarters of the area. The doctors within the area, and not the single practitioner, should together form the unit. Each medical unit would have complete control over its own local professional affairs, and, together with the local Health Committee, would be responsible for the health of the area it serves. The functions of the unit would not be confined to the treatment of disease after it has arisen, but also to teaching the laws of healthy living to its community and to seeing that healthy conditions are maintained, *e.g.* by securing a wholesome and adequate food supply, by protecting weakly individuals from overwork, and by generally attending to the welfare of women and children. "The several activities of this National Health Service should all pivot upon the *local hospital as an Institute of Health.*"

The activities of a National Health Service would include:—

(1) The *Public Health Service*, administered as at present by the Medical Officer of Health and a largely augmented staff, dealing largely with material environment and infection.

(2) A *Domiciliary and Nursing Service*, consisting of doctors, health-visitors, nurses, and midwives, dealing with cases usually treated at home, but working in co-operation on preventive lines, and particularly in relation to expectant and nursing mothers, infants, and young

children. Facilities would be afforded for practitioners transferring cases from the home to hospital whenever it is deemed expedient.

(3) A *School Health Service*, which would be conducted much as at present, but more amply provided with nurses to undertake treatment under the direction of the doctors.

(4) An *Industrial Health Service*, which would give real supervision of the health of the industrial population, ensuring healthy working conditions in every factory, workshop, or office, and inquiring into all accidents, and, with the aid of welfare supervisors, taking steps to prevent illness or to treat it in its earliest stages. The members of this service, both medical and lay, would make a special study of such subjects as the causes of fatigue, periods and rates of working, and the early manifestations of failure of function or disease.

(5) A *Research Service* would form a part of each unit. It would be recruited from men and women specially trained in the medical schools, who must be adequately remunerated.

(6) A most important item in each unit would be the *Hospital and Clinical Service*. "No public medical service can be efficient that does not provide an adequate number of hospital beds for those requiring institutional treatment. One reason for the inefficiency of the Medical service under the National Insurance Act is that it has no hospital accommodation which it can call its own." It is pointed out that in Great Britain there are now 30,000 beds supported by voluntary contributions, while the number required, even for the minimum of two beds per 1000 of the population, is 80,000. "The only possible method of coping with the urgent necessity for increased accommodation is for local health authorities to establish their own hospitals, to which all patients requiring institutional treatment would have a right of admission." Such hospitals would be the health centre or institute for each area.

(7) The Committee are of opinion that "all the present *voluntary hospitals* should eventually be merged into the public hospital system," but that at first "they might be given a choice of remaining on an entirely voluntary basis, or of being taken over by the health authorities, or of receiving subsidies from the rates, provided that on inspection they turned out to be efficiently maintained."

With regard to the financial responsibility for the service, it is suggested that, as the health of the nation is as much of national as of local concern, substantial grants in aid should be made to the local authorities. Reasons are given why a State medical service should be free and open to all. There must be a good distribution of doctors according to the needs of each locality, a proper regulation of the hours of work, and adequate holidays for all doctors. To keep himself abreast with the advance of knowledge, every doctor must receive adequate "study leave" from time to time.

The second part of the report gives a detailed scheme for working out the principles set forth in the first part. It does not lend itself to condensation, but is worthy of study by those who will be concerned in readjusting our existing machinery to meet the needs of changed conditions.

Appointments.

Dr. Chalmers Watson and Dr. Edwin Bramwell have been promoted to be Ordinary Physicians to the Royal Infirmary.

Professor F. M. Caird has been appointed a Consulting Surgeon to the Royal Infirmary.

Mr. Lewis Beesly has been appointed Acting Surgeon, and Dr. F. W. N. Haultain, Gynecologist to the Chalmers Hospital, Edinburgh.

WOUND SHOCK AND ITS TREATMENT, INCLUDING A REPORT ON CERTAIN CASES OBSERVED IN NO. 3 MOBILE LABORATORY, FRANCE.

By JAMES ELVINS M'CARTNEY, late Captain, R.A.M.C.,
Mouat Scholar.

Introduction.

In the light of the knowledge gained during the present war, our views on the subject of "Shock" have undergone a severe revision. Previous to 1914, our conception of shock was limited to the theories of Crile and Yandell Henderson. The former supposed the low blood pressure was due to an exhaustion of the vasomotor centre following excessive sensory stimulation. It was supposed that, as a result of this low pressure, the blood accumulated in the veins of the splanchnic area, thereby diminishing greatly the output of the heart by lessening the amount of blood entering it during diastole.

Yandell Henderson regarded the condition as essentially one of oligæmia—a lessening of the blood in effective circulation. This oligæmia, he considered, was due to a deficiency in the carbon dioxide content of the blood caused by excessive respiration (hyperpnea) in response to painful stimuli. This condition he termed "acapnea."

Wound Shock.

Shock as seen under war conditions presents a very striking picture, the appearance being that of a severe intoxication. The face of the patient is pale and bloodless, and the expression anxious. He is generally very restless, and is sometimes in a stupor. The body is cold and clammy to the touch, and the forehead is covered with a cold sweat. The body temperature is subnormal. The pulse frequently cannot be felt at the wrist, and when palpable is feeble and of low tension. The respiration is but little affected. When spoken to, the patient answers in a dulled, vague manner. The blood pressure is invariably low, and there is a diminution of blood volume which may or may not be due to hæmorrhage.

In the early days of the war there was much doubt as to the real condition under discussion, as many cases of severe intoxi-

cation, due to an infection such as gas gangrene, were classed as wound shock. Thus, much confusion arose as to the proper recognition of wound shock.

In 1917, Cowell, working in an advanced dressing station, distinguished between two types of wound shock:—

(1) *Primary Shock*, which follows immediately after wounding and is analogous to fainting. Cowell found that during periods of calm the soldier's blood pressure is normal, but during the excitement of severe bombing or shelling the blood pressure is raised, and may be from 140–180 mm. of mercury. Under these conditions the nervous system becomes over-excited and in an unstable condition. At the time of wounding there is a sudden weakening of vasomotor tone, possibly due to reflex inhibition.

Primary shock, therefore, in all probability, is purely nervous in origin.

(2) *Secondary Shock*.—This occurs after a definite interval after injury, and several hours may elapse from the time of wounding before shock supervenes. This secondary shock constitutes practically the whole of the cases observed.

Theories and Treatment.

Of the early work done on shock during the war the most prominent is that associated with the names of Crile and Cannon —the acidosis theory. According to these observers, shock is produced by an increase of acid bye-products as a result of stagnation in the circulatory system. Various factors contribute toward this stagnation, such as cold, exhaustion, pain, want of sleep, etc. The result of the stagnation is a failure to oxidise the acid bye-products of metabolism, with the result that there is an increased quantity of acid in the blood stream. This was evidenced by the increase of the hydrogen ion concentration and by the diminution of the alkali reserve. Cannon showed that there is a concentration of blood in the capillaries, with the result that there is a deficient oxygen supply carried to the muscles. Consequent upon this is an increased output of lactic acid which lowers the blood pressure. This lowering of blood pressure still further diminishes the amount of oxygen carried to the tissues, with the result that there is a still further amount of acid poured into the blood stream. Thus the process is a vicious circle.

Cannon and his co-workers found the count of red blood corpuscles in capillary blood very much higher than the count in venous blood, the difference being frequently as much as 2,500,000 corpuscles per cubic millimetre. This indicates that the "lost blood" of shock is to be found in the congestion or concentration of the blood in capillary areas.

The chemical analysis of the blood showed an increase in the hydrogen ion concentration which corresponded roughly to the degree of shock and the lowering of the blood pressure. This theory assumed, therefore, that the cause of shock was an increased acidosis and consequent lowering of the alkali reserve of the blood.

The treatment was to give an intravenous injection of 4 per cent. sodium bicarbonate in 10 per cent. glucose solution. In addition, the patient was warmed, and hot alkaline drinks, well sweetened, were administered if he were conscious. The glucose was added as a substance easily oxidised, and which required no metabolic processes (and consequently no energy) to transform it into a condition for assimilation.

Unfortunately, while the theory seemed admirable, the practice was disappointing. A few cases showed improvement, but in the majority of cases, although excess of alkali had been administered, the patient rapidly became worse and died. Evidently acidosis, though undoubtedly a symptom, and possibly a factor, was not the main cause of shock.

The marked lowering of blood pressure being the most striking symptom of shock, Bayliss tried the effect of solutions which would not only raise the blood pressure but keep it sustained. With normal saline solution it was impossible (except in massive doses) to bring the blood pressure even up to normal, and on discontinuing the injection the fluid rapidly escaped into the tissues and the blood pressure was quickly lowered again.

Fraser and Cowell found normal saline of no practical use in hæmorrhage. With hypertonic saline any benefit was only transient. The injection and subsequent escape into the tissues of such a large amount of fluid sometimes gave rise to œdema of the lung, and the introduction of saline, instead of being beneficial, might actually be harmful.

As fluid was lost by diffusion through the capillaries, it was obvious that the dissolved crystalloids could also permeate the capillary wall. Bayliss therefore tried intravenous injections of solutions containing colloids. If the effects of transfusion are

to be sustained and not merely momentary, the colloid solution used must have the same osmotic pressure as blood. It is important also that the colloid solution should have the same viscosity as blood, in addition to having the same osmotic pressure. Bayliss found that only a 6 per cent. solution of gelatine and a 6 per cent. solution of gum-arabic answered to these requirements.

As the viscosity of the gelatine solution varies on heating, and as the solutions are difficult to sterilise, easily become affected by moulds, and often contain pathogenic organisms, it was decided to use only gum-arabic solution for intravenous injections.

Points in favour of the gum solution are:—

(1) It is a neutral and chemically inert substance.
(2) It is non-toxic even in massive doses.
(3) It has no hæmolytic or agglutinating properties with respect to human blood.
(4) No anaphylactic symptoms have ever been observed after its use.

The gum-arabic solution used was a 6 per cent. solution in 0·9 per cent. saline, thus making it isotonic with blood. The "gum-saline" solution used by many casualty clearing stations in the First Army was made at No. 3 Mobile Laboratory. The solution was filtered through paper pulp in a Buchner funnel by means of a vacuum pump, put into stoppered pint bottles, and autoclaved.

Work by Drummond and Taylor at an advanced surgical centre, four miles from the line, proved the utility of gum-saline solution in cases of secondary shock.

Robertson showed the value of transfusion of blood, especially in cases of hæmorrhage. He devised several methods of transfusing blood, amongst which is the "citrate method" which was used in the series of cases seen.

Personal Observations.

During the last two and a half years I have had the opportunity of seeing and studying many cases of shock.

Primary Shock.

While acting as medical officer to a battalion during the Battle of the Somme, I saw several cases of what I would now recognise as primary shock. This condition came on immedi-

ately after wounding. The face of the wounded man was pale, the eyes closed, the pulse scarcely perceptible, and the patient appeared as in a fainting fit. With stimulants, *e.g.* rum or brandy, the patient sometimes recovered, but he was often sent down to the advanced dressing station in a condition of shock. Owing to the large number of casualties and the heavy shelling, it was impossible to make any observations on these cases of primary shock.

Secondary Shock.

My chief experience of this was at casualty clearing station groups during 1918. The gum solution used by Drummond and Taylor (see Memo. No. 3, Shock Committee) was made at No. 3 Mobile Laboratory, and I had the opportunity of seeing many of their cases. My first experiences of treatment were at the Pernes group of clearing stations in April 1918 during the German offensive. Owing to the large numbers of wounded that kept pouring into the hospitals, the staff was unable to cope with the work, so the personnel of the laboratory, consisting of Major J. W. M'Nee, Captain A. F. Sladden, and myself, organised a resuscitation ward for the treatment of shock. The clearing station group at Pernes was about twenty miles from the front line, and here 150 cases passed through our hands.

Later on, during the battle for Cambrai in September 1918, I went to No. 33 Casualty Clearing Station, and started a resuscitation ward there, and treated forty-six cases. Unfortunately, the observations on these cases were not completed, as I was recalled to the laboratory owing to the outbreak of dysentery and typhoid fever. This casualty clearing station was about twenty-five miles from the line.

It is important to realise that at both these hospitals, cases were seen *late*, the majority of the men having been wounded eighteen hours or more. Owing to the heavy casualties, the difficulty of clearing the battlefield, and the long journey by ambulance cars over bad roads, many men were admitted who had been in a state of secondary shock for from three to six hours, and even longer. This accounts for the high mortality in our series of cases. The time factor is of great importance, and must be considered always when comparing the effects of treatment by different observers on different series of cases. Thus Drummond and Taylor worked in an advanced surgical centre, four miles

from the front line, while Cowell, Cannon, and Fraser made their observations in Bethune, five and a half miles behind the line. In both these series of cases observations were made under "peace warfare" conditions. Immediately a man was hit, he was carried to the advanced dressing station, and conveyed at once by ambulance car over good roads to the hospital, arriving there from two to three hours after being wounded. Thus, these two sets of observers carried out treatment under most favourable conditions.

Treatment of Shock.

The methods of treatment employed were calculated to counteract three phenomena common to all cases of shock:—

(1) Lowering of body temperature.

(2) Lowering of blood pressure.

(3) Diminution of blood volume.

None but "shocked" cases were treated in the resuscitation ward. This ward consisted of a number of marquees joined together and fitted with floor boards. It was well lit and contained twenty hospital beds, three heaters for stretchers, three stoves for warming the ward, Primus stoves, a supply of hot water and hot drinks, infusion apparatus, instruments, ligatures and dressings, morphine and stimulants.

On admission the patient was always very cold, and had a subnormal temperature. (The weather was bitterly cold, and he had been a long time lying out before he could be picked up.) The patient was undressed, covered with blankets and surrounded by hot water bottles, and put on the heater to warm up. This heater consisted of an iron frame supported by four legs, like a long narrow table without a top. The stretchers fitted on this, forming a top to the table. The legs were draped round with blankets, and in the tent so formed a Primus stove was placed so that the hot air ascending warmed up the stretcher containing the patient. The patient was given hot drinks if conscious. His wounds were then looked at to see if there was any hæmorrhage, fractures were splinted, and the patient was made as comfortable as possible. He was left on the heater until warmed up, and, under the influence of warmth and morphia, many patients went into a deep and refreshing sleep.

As soon as possible after the patient was admitted, the following, *pro forma*, was filled up as completely as possible; but during a rush of wounded, only the essentials could be entered.

BLOOD TRANSFUSION AND GUM INFUSION.

Hospital. | Regt. No. Rank and Name. Regiment.

(1) Time and date of receipt of wound.....
(2) Time and date of admission to hospital.....
(3) Type and location of wound.....
(4) Special treatment prior to admission .....
(5) Early hæmorrhage (*a*) External.....
(*b*) Internal.....
(6) Clinical signs and symptoms on admission (*a*) Cold.....(*b*) Pallor.....(*c*) Vomiting.....
(*d*) Restlessness.....(*e*) Pulse rate .....
(*f*) Resp. rate.....
(*g*) Blood press.—systolic.....diastolic.....
(*h*) Blood count.....Hæmoglobin %.....

(7) TREATMENT—

Morphia (total).....

Gum { amounts..... times.....

Blood { Method used..... Amounts..... Times..... Group donor (whether Group IV. or same group as recipient).

(8) Reaction to treatment—

(*a*) Pulse.....
(*b*) Blood pressure.....
(*c*) General.....

Time elapsing between transfusion or infusion and operation.....

SUBSEQUENT HISTORY—

Including nature of operation and anæsthetic employed, any special operative treatment, further gum infusion or blood transfusion, and the progress of the case.

Signature of M. O.

To be returned to Consulting Surgeon,
First Army.

Morphine was found to be very beneficial, and was used with much success. The restlessness and anxiety were stopped, the

pain was much alleviated, and the patient dropped off in a refreshing sleep. Morphine was a great standby, and was the only drug found to be definitely beneficial. In ordinary cases the effect of such simple remedies as warmth, rest, fluid by the mouth were quite sufficient to restore the circulation, so that a rapid amputation or excision of tissue could be carried out under nitrous oxide and oxygen anæsthesia. In many cases, however, the patient showed no response to warmth. He still remained cold, restless, and pale, and his pulse continued to be imperceptible. He was then given intravenous injections. Except in cases where there had been severe hæmorrhage, gum-saline solutions were given as a routine. The amount usually given varied from 500–700 c.c. The apparatus used was a litre drug-bottle with the bottom removed, a rubber cork, pierced by a piece of glass tubing, fitted into the neck. Connected to the glass tube was a piece of rubber tubing about 2½ feet long. To the other end of the tubing was attached a short wide needle. Later a Bianchi tube, which fitted the neck of the milk-bottle which contained the gum, was used. The gum was always warmed well above blood-heat, as it became much cooled down in its passage through the rubber tubing. The best results are obtained when the fluid enters the vein at a temperature of 39°–40° C. The extra heat of the solution seemed to warm up the patient quickly. The median basilic vein was usually chosen for the infusion, but the internal saphenous vein was used when both upper limbs were wounded. For sterilising the skin tincture of iodine was used. Owing to the collapsed state of the veins it was often very difficult to judge whether the needle was actually in the lumen or not. In fact, the vein sometimes could not be seen even after constricting the arm and flicking the skin. If fluid is run in when the needle is not properly in the vein, the subcutaneous tissue becomes distended with fluid, which, forcing the walls of the vein together, makes it impossible to get the needle into the lumen without cutting down and exposing the vein. It was my practice to attach an adapter to the end of the rubber tube. The needle was then introduced under the skin, and when the needle was in the lumen of the vein (as evidenced by the escape of a few drops of blood) the adapter was fitted and the solution run in. Sometimes, in spite of every effort to dilate the vein, it was found impossible to introduce the needle, and cutting down on the vein was resorted to. The gum-saline solution was run in *slowly* by gravity, allowing eighteen to twenty minutes for each pint.

The effects of the gum infusion were often very marked. The pulse became perceptible and strong; some colour returned to the lips, and the patient became more alert and less stuporose. If the pulse had improved sufficiently, the patient was sent to the operating theatre to have his wounds dressed under gas and oxygen anæsthesia.

Many patients, however, failed to respond to gum infusion, and so, after some time had elapsed, in order to see if any benefit would accrue, they were given a transfusion of whole blood. The citrate method of Robertson was employed. The apparatus consisted of a

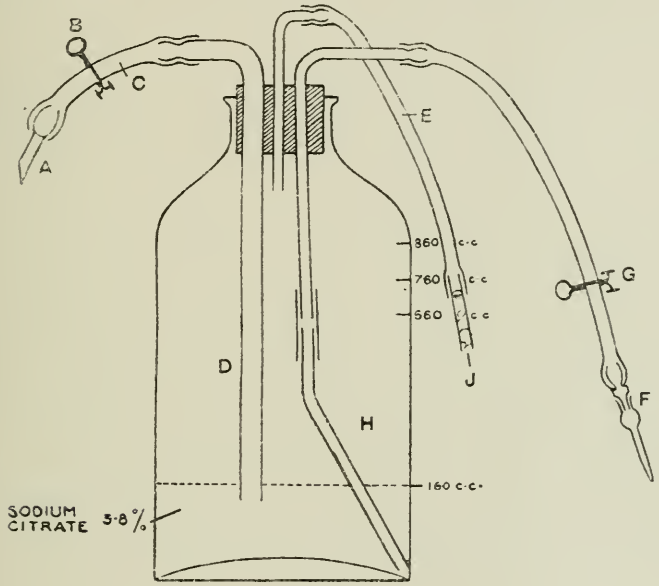

Fig. 1.

litre bottle having a tight-fitting cork bored with three holes (see Fig. 1). The bottle was graduated at 160 c.c., 660 c.c., 760 c.c., 860 c.c. The tube D was of wide-bored glass tubing, connected by a *short* piece of rubber tubing C to a hollow needle A. This needle had an internal diameter of $1\frac{1}{2}$ or 2 millimetres. A clip B closed the rubber tube C. Blood was drawn in from the donor through this tube. The tube E just passed below the cork and had a length of rubber tube and a mouthpiece, so that pressure or suction could be applied. The blood was given to the patient through the needle F, which had an internal diameter of 1 millimetre. The bent tube H was to ensure that the bottle was completely emptied of blood. A 3·8 per cent. solution of potassium

citrate (isotonic with blood) was run into the bottle up to the 160 c.c. mark. The cork and its tubes were inserted, and the tube D adjusted so that the end just dipped beneath the solution. The clip G was closed, and the clip B opened. By means of the mouthpiece J the pressure in the bottle was raised so that the citrate solution was forced out of the needle A. The tube C was clipped so that the system A C D was full of citrate solution.

A donor having been selected, he was made to lie on a bed in the ward near the recipient. The skin over his median basilic vein was sterilised by alcohol, ether, and tincture of iodine. A constricting band was placed round the upper arm in order to distend the vein.

The needle A was introduced into the vein, the clip B released, and suction applied by the mouthpiece, and the blood immediately flowed into the citrate solution. Robertson recommends a Higginson syringe reversed for suction, but we found this unsatisfactory, as we had no means of gauging the amount of suction. Too little suction quickly caused stagnation and clotting in the tube, while too much sucked the wall of the vein over the opening of the needle and prevented all flow. By suction with the mouth the optimum flow was obtained. The bottle was gently rotated so as to mix blood and citrate, and when the fluid rose to the marks 660, 760, 860 c.c. it indicated that 500, 600, or 700 c.c. of blood had been taken. When sufficient blood had been taken, the clip B was put on, and then the needle withdrawn from the vein. If the needle is withdrawn first, blood-clot is drawn from the tubes C and D into the bottle, and this must be avoided. Clip G was then opened, pressure forced into the bottle, and the citrated blood flowed out of the needle F. The clip was closed and the needle F was inserted into the recipient's vein, and the blood given in exactly the same way as a gum-saline infusion. A Higginson syringe was used to obtain this pressure necessary for injection. Needless to say, the whole operation was carried out under aseptic precautions. In all cases the "blood group" of both donor and recipient was ascertained, and, if possible, a donor of same group as the recipient was used. A number of donors of Group IV. were kept in readiness in cases of emergency, as Group IV. are universal donors. All donors used were volunteers. The blood groups were ascertained by Lee's methed. A drop of Group II. serum and a drop of Group III. serum were placed side by side on a glass slide. The finger or ear of the donor was pricked and a loopful of blood mixed with each drop of II. and III. serum. The slide was gently

rocked, and if agglutination took place it was noticed within a minute of mixing.

Agglutination in both drops indicated . . Group I.
„ in Group III. serum but not in Group II. indicated . . . Group II.
„ in Group II. serum but not in Group III. indicated . . . Group III.
„ in neither drops indicated . . Group IV.

When a patient is transfused, it is only the reaction of the *donor's corpuscles* with the recipient's *serum* (plasma) that is taken into account, as the *donor's serum* is so diluted on transfusion by the recipient's blood that it can have no effect on the *recipient's corpuscles.*

In the following table the reactions of the various blood groups may be easily seen :—

		Corpuscles.			
		I.	II.	III.	IV.
Serum.	I.	–	–	–	–
	II.	+	–	+	–
	III.	+	+	–	–
	IV.	+	+	+	–

\+ =agglutination.
– =non-agglutination.

One of the chief objects of the work undertaken by us was to determine the relative values of gum solution and whole blood in cases of shock, and from the results of our cases we concluded :—

(1) That where shock is due to hæmorrhage, blood is much superior. The results are "dramatic," and the improvement is rapid. This is due to the restoration to the circulation of red blood corpuscles.

(2) That in cases of shock combined with small or moderate amounts of hæmorrhage, gum gave results equally as good as blood.

(3) Cases without hæmorrhage which did not respond to gum also failed to react to a subsequent injection of blood.

These results have been borne out by the experimental work of Bayliss and others. It is obvious that in a severe hæmorrhage there is a serious loss of red blood corpuscles, causing anæmia of the brain and vital centres, and the shock is due to the want of oxygen in these centres. These corpuscles can only be replaced by blood, and thus the oxygen carriers, in addition to the fluid, are replaced. In cases of shock not due entirely to hæmorrhage there is a loss of fluid only from the circulation, and there is an adequate supply of red blood corpuscles to carry on the work of oxygenation of the tissues, and hence further corpuscles are not required. The gum solution is equally as good as blood plasma in increasing and maintaining arterial pressure. The saving of time, and also of donors, is enormous, since transfusion of blood may be restricted to cases of severe hæmorrhage only. Moreover, the technique of transfusion is difficult unless to an experienced operator, and, owing to the low state of resistance of the recipient, pathogenic organisms can quickly multiply if they gain access to the circulation through faulty technique. (Two cases of streptococcal septicæmia actually occurred in a base hospital as a result of blood transfusion.) Cases of rigor after gum infusion have been reported by certain observers. In one case which was brought to my notice I found that the gum solution had been made with water from a shallow well instead of distilled water. A bacteriological examination of this water showed B. coli present in 0·01 c.c., while the number of colonies that developed from 1 c.c. on agar plates was innumerable. The effect therefore of the introduction of 500 c.c. of this gum solution was to give the patient an intravenous vaccine of many hundreds of millions of dead organisms. No wonder there were rigors!

When all the deaths from anatomical lesions, and all the cases in which methods of resuscitation were successful, were accounted for, we were still left with a considerable number of men who, in spite of all treatment, went steadily downhill and died. We came to regard these cases, which formed more than two-fifths of those admitted into the resuscitation ward, as the true examples of wound shock. Autopsies were made on these cases very soon after death, and in no case did we find any evidence of extensive bacterial infection at the time of death; thus one suggestion as to the cause of shock was negatived. It was noticed that a common feature of all these cases was the extensive muscle injury. Several

cases ending fatally were observed of small multiple bomb wounds. These wounds collectively had caused great laceration of muscle tissue, without damaging any vital structures. Moreover, bacterial infection was shown to be unimportant in these wounds. Many of the fatal shock cases were compound fractures of the femur, with very extensive muscle damage.

The majority of these cases of what we considered true wound shock, and in which there was extensive muscle damage, died without making the least attempt at rallying, even after treatment by blood and gum transfusion. Some cases, however, showed a temporary improvement, but these rapidly sank again. Therefore, when a case in which there was a severe laceration of a limb showed any improvement, a rapid guillotine amputation was done under gas and oxygen anæsthesia. The results obtained were often very striking; the operation being followed by a remarkable and maintained improvement, which appeared to be a direct sequel to the removal of the damaged tissue. In one case, in which the condition of shock was so severe as to prevent the moving of the patient, a tourniquet was applied tightly round the limb: this was so badly smashed that if the patient survived an amputation was inevitable. Resuscitation methods were carried out, the patient improved, the leg was amputated, and there was an uninterrupted recovery.

A few protocols illustrating some of the points referred to are given below:—

Case I.—An example of severe hæmorrhage not complicated by much shock. Rapid recovery after gum-salt infusion.

Pte. M., 21st West Yorks. Shell wounds of both thighs. Severe hæmorrhage noted on admission at midnight. Taken straight to the operating theatre, in a pulseless condition, and very cold. Infused with 6 per cent. gum-salt solution during operation, at which the profunda femoris artery was found bleeding and was ligated. Pulse improved quickly after infusion, and the patient made a good recovery.

Case II.—An example of very severe secondary hæmorrhage uncomplicated by shock. Rapid recovery after gum-salt infusion.

Lieut. S., 8th K.O.R. Lancs. Admitted with a shell wound of the elbow-joint. Operated on at once, and elbow-joint excised. Appeared to be doing well, but suddenly during the night had a severe secondary hæmorrhage, and was found pulseless and almost dead. Bleeding stopped by pressure, and gum-salt infusion given. The pulse returned at once, and the patient made a rapid and complete recovery.

All the cases recorded below presented extensive laceration of

muscle, without injury to bones or to any vital structure or organ. All ended fatally, with the exception of Case VIII.

Case III.—Pte. R., 1st Black Watch. Multiple small bomb wounds of left thigh, left leg, right shoulder, etc. No injury to bone. Pulseless and cold. Infused with 500 c.c. of gum-salt solution, but never rallied. Died six hours after admission.

Case IV.—Pte. R., 4th Royal Fusiliers. Multiple bomb wounds of left arm, right thigh, right leg, and right foot. No bone injury. Infused with gum-salt solution soon after admission, but remained pulseless. Transfused with blood four hours later, but showed only a very transient reaction. Died rapidly.

Case V.—Pte. B., 11th Manchesters. Shell wounds of left pectoral region and of right deltoid muscle. No injury to bone. Operated on at once, and wounds partially cleaned. Condition grave, and gum-salt infusion given. Slight temporary improvement resulted. One hour later, 600 c.c. of blood transfused. Death occurred in a few hours.

Case VI.—Sergt. D., 1st Northumberland Fusiliers. Shell wounds of scrotum, left buttock, and front of left thigh. Pulseless and very cold on admission. Warmed, and infused with 750 c.c. of gum-salt solution. Very slight temporary improvement, but death occurred six hours after admission.

Case VII.—Pte. M., 1st Northumberland Fusiliers. Shell wounds of right arm and left thigh. No bony injury. Pulseless, cold, and vomiting on admission. Infused with 600 c.c. of gum-salt solution, and showed a temporary improvement. Relapsed later, and became profoundly shocked. Transfused with 400 c.c. of blood, but died fourteen hours after admission.

Case VIII.—A case in which removal of a lacerated limb was followed by rapid improvement.

Pte. C., 1st Rifle Brigade. Admitted with a severe wound above the knee, causing extensive injury to muscle. Pulseless and pallid. Infused with gum-salt solution three hours after admission, and warmed. Condition improved slightly, and a quick "guillotine" amputation through the thigh was performed eight hours after admission. Thereafter improvement was immediate and maintained. The patient was evacuated to the base, doing well.

All the severe cases of shock had extensive muscle injury, and in those cases of shock which died in spite of all efforts to save them, muscle injury was a very prominent feature. Moreover, when the damaged muscle was removed by a rapid guillotine

amputation, or when a tourniquet was applied proximal to the damaged part, then the methods for combating shock were successful. From these facts it was suggested that the absorption of some toxic product of damaged muscle may have a definite etiological importance in the production of wound shock.

Bayliss and Cannon, working about the same time but independently, have given experimental proof of this view. They showed in anæsthetised cats that hammering of the limb muscles (without actual bone damage) causes a primary fall of blood pressure, usually followed by a secondary fall, ending in death. If this bruising is combined with a loss of 22 per cent. of the blood volume (this loss being quite innocuous to a normal cat), the effect is to exaggerate the state of shock, or to bring on a rapidly fatal secondary shock. Even after this aggravation of shock by hæmorrhage the blood pressure can be restored to and maintained at normal by gum-saline infusion. This fall of blood pressure is not due to a nervous reflex, as it occurs if the spinal cord is divided. Moreover, if the iliac arteries and veins be clamped before the lesion is inflicted, there is no fall of blood pressure until the clamps are removed, although all the nervous connections are intact. Bayliss and Cannon also showed that the alkali reserve is not lowered in these experimental shock cases, and the injection of sodium bicarbonate solution has no effect in preventing the development of shock. Movement and massage of the injured limb causes an increased fall of blood pressure, doubtless by an increase of toxic substances entering the general circulation. This explains the beneficial result of using a Thomas' splint for all fractures and wounds of the limbs.

In this connection the work of Dale and Richards with a known product of muscle degeneration—histamine—is interesting. They showed that in the etherised cat an intravenous dose of 2 mg. of histamine per kilogram of body weight caused marked shock. This shock is characterised by a rapid lowering of blood pressure, the blood being drained away into the capillaries and tending to stagnate there. Following upon this there is a rapid loss of plasma through the capillaries, the blood in them becoming concentrated, as is evidenced by the high red blood corpuscle count. This condition is exactly similar to secondary wound shock in soldiers as seen in the clearing stations.

If the cat be not anæsthetised, it can withstand many times the lethal dose of histamine, *e.g.* as much as 10 mg. per kilogram only causes mild and evanescent symptoms of depression.

If an unanæsthetised cat has 40 per cent. of its blood taken off, it soon overcomes its initial weakness and rapidly recovers, so that in three hours' time it shows no definite abnormality. If now an intravenous injection of 3 mg. of histamine per kilogram is given, there rapidly ensues a profound shock, which is usually fatal. Moreover, other factors, such as cold and exhaustion, reduce the minimum lethal dose of histamine, and it is easy to see how hæmorrhage, pain, fatigue, and cold accentuate a mild tissue toxæmia, so that a vicious circle is commenced which ends in a profound and often fatal shock.

Summary.

Injury to muscle tissue causing a traumatic toxæmia is one of the main features causing secondary shock.

Other probable secondary factors are hæmorrhage, cold, fatigue, pain, and lack of food.

The result of shock is to cause a marked lowering of blood pressure, and the consequent anæmia affects especially the nerve centres.

(In this connection Mott examined some of the brains from our fatal cases, and found degenerative changes in the nerve cells such as appear when the brain has been anæmic for some time.)

In resuscitation work the treatment of three phenomena has alone yielded successful results, namely:—

(*a*) Lowering of body temperature.

(*b*) Lowering of blood pressure.

(*c*) Diminution of blood volume.

It is the cases of hæmorrhage combined with little shock which form the successes in resuscitation work.

The treatment of acidosis by intravenous injection of sodium bicarbonate has little or no practical value in cases of shock.

References.—Cannon and others, Memo. No. 3, Shock Committee. Drummond and Taylor, Memo. No. 3, Shock Committee. *Acidosis and Shock*, Memo. No. 7, Shock Committee. Robertson, *Blood Transfusion*, Memo. No. 4, Shock Committee. Robertson and Bock, Memo. No. 6, Shock Committee. M'Nee, Sladden and M'Cartney, *Observations on Wound Shock, especially with regard to Damage of Muscle*, Memo. No. 8, Shock Committee.

A FIELD AMBULANCE IN GALLIPOLI, EGYPT, PALESTINE, AND FRANCE.

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XV. Our Little Problems.

The battle of Hesi Ridge was the first battle of real, live, moving warfare which we had fought since we left home. The battles in Gallipoli had been trench-to-trench fights with little forward movement of troops, and on no occasion had the advance been sufficient to entail a forward movement of the field ambulance. So it had been to a large extent in the first two battles of Gaza, whilst at Romani the troops at no time had pushed far beyond their base.

Already, within a day of the fall of Gaza, we were moving rapidly after a retreating enemy, who showed that he meant to obstruct our way with a vigorous rearguard resistance. There was to be fighting, as Hesi early showed, and severe fighting, before the soil of Palestine was to be freed of the Turk. Little did we know that day how hard and stern the struggle would be before we reached the walls of Jerusalem.

Ambulance work resembles the various services of supply and transport in the difficulties and problems which arise for the first time when an army gets on the move. In the one case the stretching out of the interval between the troops and their base multiplies the problems incurred in the provision of food for man and beast, and of the ammunition, stores, and the hundred and one things that an army must have at all times and without stint. And the difficulties increase more in geometric than in arithmetic proportion as the interval lengthens out. So with the medical services, where the base recedes further and further as the army advances, the problem of getting back the wounded and the sick becomes greater and greater.

We knew all that, and we had provided for it. We had transport in ampler measure than probably any ambulances have ever had; and one was almost tempted to think, in watching the endless train of carts and camels, that our "travelling circus," as one wit irreverently called it, was a procession of luxurious wastefulness.

But that night at Hesi was calculated to dispel any such

illusion. For we had to clear the field of battle, remove the patients from the advanced to the main station, thence transport them miles back along the shore through deep, soft sand, and at any time be prepared to pack up the tons of baggage at a moment's notice and set off on the next step of our forward journey! And more: there was the prospect that the morrow might mean the whole same thing over again! If you pause to think, you will recognise the nature of the task and the risk of a faulty machine breaking, with attendant disaster.

That night, as on many nights since, we have watched the long convoys of camels and sand carts set off from the ambulance on their backward journey, knowing that they could not return for many hours, and we have wondered anxiously what the fates had in store for the morrow.

But the rules of ambulance work in the field foresee and provide for such a contingency as far as human mind can provide. An axiom, which you break at your peril, is to keep the forward ambulance section empty at all times of the night or day, so that, at a moment's notice, it can set off in the immediate wake of the moving troops. Where, as must always occur on occasions during heavy fighting, you have to compromise between mobility and immobility, this compromise must never touch the mobile section. The ambulance station behind may be split up, so that one part remains with its casualties, provided with an ample supply of food and drink and all the other requisites, and a proportion of transport to clear it gradually, whilst the other part packs up and pushes on behind the troops. This you may do, and sometimes you must do, but it is the extent of your compromise if you have a just dread of disaster.

This is one, perhaps the greatest, of the problems we had to face during our rapid progress. But it was one only. The term "communications," and what it stands for—a simple term to the untutored mind, but one of sinister significance to all who have served the stern apprenticeship of war,—was another of our daily struggles. To be a successful soldier you require all the virtues of a sage, and all the cunning of a devil. You have to know your job and do it with an intensity that engrosses your mind and energy and rides rough-shod over every obstacle. And you have to know every other man's job, and what he is doing at the moment and intends to do the next. You discover his actions or his intentions by suave means; but, failing that, you call him to stand and deliver at the peril of his life. And in return you tell

him what you think he should know about your doings or your prospective doings, whether he asks you or not. When you can do all that and fight your hardest all the time you are qualifying for soldiership, and you understand the elements of "communications." You have to be on the spot, and all other spots as well.

These axioms must dominate your living at all times and at all places, whether you are a combatant or non-combatant, whether you are Infantry, Artillery, or A.S.C., or R.E., or R.A.M.C. If they do not, and in your ignorance you remain rolled in your mantle of layman obsoleteness, you become smothered in your own task. You are soon at sea, your communications cut.

The sooner you take these lessons to yourself with special zeal, if you are in the R.A.M.C., the better for yourself and those others who depend on you. For during the stress of the fight you are apt to be forgotten unless you obtrude your presence to the risk of annoyance. In an ambulance you have to keep in constant touch with what is going on in front, and you have to know what is taking place behind. You must be *au fait* with the movements of the brigade and the changing dispositions of the battalions of that brigade.

The forward links in the ambulance chain we maintained during the advance by keeping the advanced station as close as circumstances permitted to brigade headquarters. Runners stationed at the "signals" office sped across with all the orders, and it was an easy journey for an officer, when there was a suspicion that something special was afoot. Then, still further forward, each regimental medical officer took with him, wherever he went with his battalion, some stretcher-bearers from the ambulance, who passed backwards and forwards to the advanced station with the casualties, and in the process kept alive the bond between the ambulance and the moving battalions.

Then the rear station of the ambulance must know at any moment the precise location and the likely movements of the forward station. This would be done by the returning convoys, or, in case of special need, by mounted orderlies on picked steeds.

During a dark night, in an unknown land, a compass and a map will help you on your way. But you must not trust the map too implicitly, and the clouds have a perverse habit of blocking out the only stars you know, at the precise moment which matters.

At such a time you cherish a good guide as worth more to you than all the gold the earth ever gave, and if you want to avoid the

holes and ruts that break the axles of your carts and your camels' legs, the best guide of all is a native of the adjacent village, if you have someone by you who can speak his language.

In an ambulance it is essential to keep in touch, not only with the headquarters of the brigade, but also the headquarters of the division. The A.D.M.S. must know where you are, for he may at any moment, when occasion demands it, have to push your ambulance in to help another ambulance serving a brigade which may be miles away. And you must know where the A.D.M.S. is, for he can help you out of a difficulty when no one else can. And then constant touch with the people still further behind you must be maintained, for you require to know at any moment where your patients are to go.

Such are some of the lessons to be learnt while you are courting that mistress of war—"communications." We had learnt some of them during our long tramp over the desert sand. Our later instruction came with Hesi and the days that succeeded it.

XVI. Katrah and Mughar—A Dramatic Fight.

The morning of the 9th November broke in peace and quiet. In battle there is a short interval after dawn during which, as if by mutual consent, a respite falls on everything. But as the shadows of night fled and the full brightness of day fell on the slopes of Hesi that morning it soon became apparent to all that the hush was more than the accustomed breathing-space in the struggle. The Turk had fled, leaving the strong ridge in our hands, and the distant sound of his guns, which fired their parting protest, showed the surmise to be true, if any confirmation were required.

The brigade moved forward, and the advanced dressing station followed brigade headquarters to the neighbourhood of Herbieh. By the morning, the station on the beach was quietening down, and the last of the patients were soon set on their backward journey. It had been our intention to strike our tents before the light of day revealed them to the Turk, but, this being no longer necessary, we finished our work in comfort and then packed up. In the afternoon we had a new camp established near the brigade at Herbieh. We meanwhile anxiously awaited the arrival of the carts and camels which had left the preceding day, but before nightfall they had all come back, escorted by the guides whom we had left behind to show them on their way.

Herbieh is near the eastern margin of the belt of sand that runs northwards along the Syrian coast, a direct prolongation of the Sinai desert. This sand-belt becomes narrower as it extends into Palestine, and at Herbieh it is about two miles broad. The junction between the sand and the firmer soil is marked abruptly by the grass and vegetation that covers the latter with a uniform surface of green, in contrast with the yellow, barren surface of the desert.

The main road from Gaza to Jaffa runs along the margin of the solid country, and we welcomed its sight as we saw it running northwards close to Herbieh that day. For already the rapid advance over the soft sand had tested man and horse, and there are limits to animal endurance.

The pestilential swarm of flies that settled down on us almost before we had pitched our tents at Herbieh, and the filth which always accompanies this pest, often with disease in its train, soon decided us to give the village a wide berth, and the following day we moved across beside the main road to a piece of clean, virgin soil.

From this moment till the time when we again struck the sand-belt at Jaffa, late in the campaign, we always had the advantage of hard ground for our operations. Of good roads such as we know them in the West there are none in Palestine, so far as our experience showed, only tracks across the country, ill-kept and uneven. As we found them, their natural poverty was increased by the heavy traffic which the Turks had subjected them to, without bestowing on them in return the large and constant attention which military employment demands. On some of the main tracks you could go in a motor car with a certain measure of comfort to yourself and safety to the car so long as the weather was good. But, after bad weather, traffic cut them up, and for days on end all road passage would be blocked. There is one road which, as we found it, was passably good—the road from Jaffa to Jerusalem. It is metalled and broad, and, before the havoc of war had settled on it, it must have been a godsend to the traveller.

The question of roads is one which will obtrude itself on your notice with an insistence which you can never understand till you have become a soldier and have served your term in a campaign in an uncharted land. It is another aspect of the spectre of "communications" which haunts you wherever you go. You have to be prepared at any moment to ride miles in heat or cold, dry or wet, to scour the country in search of a track that

will take your sand carts or camels, and woe betide you if you miss a rut or misjudge the angle of a steep. For disaster, in the shape of broken shaft-poles or overturned camels, will surely wreak its nemesis on you. And, then, in your dealings with roads you have to cultivate the utmost self-control, for you will explore the capacities of your road to the utmost, and leave it satisfied, only to find when you return with your lengthy procession that, after an hour's rain such as Palestine alone knows, your path is gone. It is nothing but a slippery incline of greasy mud, down which neither mule nor camel can descend in safety. In a gully, at the bottom of such a bank, we have seen camels with legs that had been split apart as they floundered in the mud, lying where they had been shot, and wagons turned on their back inextricably lost. They were leavings of a column which had passed in the night, and which had to force its way through at all costs.

But we were novices in these early days. We welcomed the first return to solid ground at Herbieh. Within an hour or two we had motor ambulance cars from Gaza, and for the time our difficulties of transport were lightened. Our patients were carried back to Deir Seneid, to a section of the ambulance which we planted there as a link between us and Gaza, where a hospital was soon opened up.

The routed Turk was to be given no time to reorganise his forces and his defence. The next day, the 11th, we were on the move again, and in the early afternoon we were camped beside the brigade at Mejdel. All along the road, as we passed, we met a continual stream of fugitives, men, women, children, donkeys, horses, cattle, all hurrying back to their forsaken homes at Gaza and the other towns and villages which we had left behind us. It was a sight to soften the hardest heart, and the pathos was only relieved by the evident relief and joy on the faces of the vagrants as they thought of their deliverance.

On our arrival at Mejdel we were immediately inundated with wounded and sick from the brigade of our division which had pushed on ahead of us close on the heels of the Turk. He was to be given not a moment's rest. He was fighting hard and bravely, but he had already paid a heavy toll in killed, wounded, and prisoners. By this time we were receiving through our hands a large number of wounded Turks, and by the aid of our interpreters we learnt the story of their dire straits; whilst over beside us, as we lay at Mejdel, was a large body of prisoners who had just

arrived, and whose appearance told its story of dejection and despair.

There was still no pause. On the morning of the 13th the tents and bivouacs were again struck, and the brigade, taking with it the advanced dressing station, moved on to Esdud (Ashdod), whilst the remainder of the ambulance advanced a few miles to establish a camp on the main Gaza road, which we had temporarily left whilst camped at Mejdel. Here before long the main station was again hard at work receiving the wounded of the whole division, and for the first time since leaving the precincts of Gaza it parted company with the brigade and the advanced station, which it was not to see again for two days.

By this arrangement the main station was required to establish and maintain the chain of evacuation between the forward troops and the casualty clearing station behind. Whatever happens, this chain must be kept intact at every step, and to do this it is often necessary to temporarily divorce a part of the ambulance from its brigade and to divert it to serve divisional needs.

By this time the rapidity of the advance had been so great that it is not to be wondered at if the lengthened line of communications gave rise to some anxiety. But the problem which faced us was only one aspect of the many problems which the startling rapidity of the forward progress brought with it in increasing measure. There were many others vital and impelling to engage the attention of the staff, for the division had to be fed, and the guns and rifles had to be constantly supplied. And where an army can be fed the wounded can always be carried off. Night and day we eagerly scanned the roads for wagons returning after unloading their stores of food and ammunition at the forward dumps. Many a time we sent out picquets with persuasive tongues to all the roads and tracks along which transport convoys could possibly pass on their backward journey, in order to divert the stream past our doors. Limber wagons, G.S. wagons, motor tractors, lorries, staff cars, anything at all, so long as there was room for a wounded man. There is an unwritten law of the road that the wounded man must have consideration, and at all times of the night and day you have only to ask, and willing drivers draw alongside to load on your patients and speed them back to peace and comfort.

Throughout the campaign the extraneous aid thus rendered by all branches of the transport services was of inestimable value in lessening the worries of the evacuation of the wounded. In most

instances you did not dare to entrust any but the slighter cases to this, at the best, harsh mode of carriage. But by a fortunate dispensation the great majority of the casualties are only slightly affected, and, when you have dealt with them, the back of the problem is broken. Many a time, when the convoys were arriving in quick succession, and the wounded were overflowing from the tents and bivouacs on to the ground around, with nothing to shelter them from the inhospitable skies, our vigilant watcher of the road would arrive, with evident pride, leading behind him a long line of ration wagons which he had captured. A few minutes before the prospects had been dreary, but in a short time, as you watched, the throng of bandaged heads and arms and legs had melted before your eyes, and your horizon cleared again.

Whilst the rear portion of the ambulance was wrestling with its problems on the main Gaza road—a little colony of tents forsaken save for the whirlpool of traffic that circled round it—the advanced station had reached Esdud with its brigade, and lay down to rest for a few hours on the outskirts of this town of ancient story. But they were soon astir again, and under cover of dark they pushed forward along the Yebna road in the wake of their brigade.

This was a night of suppressed excitement, for we were now very close on the heel of the Turk, and at any moment the battle might flare up again. The positions in front were strong, and it was known that the foe was determined once more to attempt to stem the onrushing tide of our advance. The men had marched hard and fast during the day, and they were glad to fling themselves down on the ground close to the Yebna road, where it was decided that a halt should be made till morning.

When morning came, the brigade moved eastward to the assault of the Beshshit, Katrah, and Mughar positions. The first objectives were easily taken, and the advanced station by the afternoon was established in the open space of the village of Beshshit. A pleasant spot it was for a camp, amongst the trees, and surrounded all round by cactus hedges. Meanwhile, the brigade was held up by the dominating positions of Katrah and Mughar, which the Turks held in force. These two villages stand about a mile apart in the open plain, which stretches eastwards and northwards for miles, each on a knoll which rises abruptly from the surrounding flat.

The retention of these villages would enable the enemy to bar our advance completely, and he had decided to defend them to

the last. Along the forward slopes of the hills, and behind the cactus hedges of the villages, he had planted a formidable array of machine-guns to sweep the plain, intersected by deep wadis, across which our troops had to advance. But his determination to hang on with desperation was equalled by the zeal of our commanders that the position must be wrested from him at all costs.

The order for the assault was given, and it was then that one of the most thrilling incidents of the whole campaign was enacted before the eyes of those who watched the fight from the adjacent height of Beshshit. In the near distance the lines of infantry swept forward in successive waves, wavering under the hail of shrapnel and bullets that swept their ranks, but ever moving onward, first across the plain and then up the slopes beyond. To the right they could be seen stretching round to encircle the Turkish flank. Our guns poured their deadly charge into the enemy defences, whilst at one place a battery galloped across the shell-swept plain into action. It was a sight to hold the eyes in awe and admiration. But the battle drama reached its crisis when across the flat ground to the north of Mughar a large body of yeomanry in close formation could be seen descending on the Turkish flank. The infantrymen plodding over the flat fields watched in breathless suspense the progress of this heroic charge. It was a thing the like of which they had never seen, and never expected to see in these drab days of battle. At the sight their hearts rose high, and they advanced to the charge on the Turkish positions with redoubled efforts. The combined onslaught of English yeomen and Scottish infantry, in front and on both flanks, broke through the Turkish defence, and he fled in confusion, leaving a whole battalion in our hands, with numerous machine-guns and some field pieces.

It was a great fight, ending in a supreme success which redounded to the credit of all, from the lower ranks upwards to the commanders who planned the *coup* and the general who led the charge at the front of his troops with an abandon of fearless courage which is still the topic of conversation when the doings of these memorable days are called back to mind.

In every fight there are incidents which, trifling though they are, stand out with distinctness against the background of welter-ing battle. Gossamer sensations, drifting from nowhere, a sudden breath of wind, the bray of a mule, or the sun's rays breaking through a cloud, may become firmly embedded for ever in the

general picture of teeming incident which accompanies the fight. Fleeting and unimportant in themselves, they become transformed by the caprice of the mind into things that remain in memory for ever, and flood back into consciousness at the thought of the associations which saw their birth.

During the fight at Katrah, as we watched it from the higher ground, there were two incidents which we saw and remember. Walking up the village street a man could be seen in the distance, in the middle of the fight, with a metal piece of the equipment on his back flashing in the sun. Unhurried and apparently unconcerned, he continued on his way as if nothing were amiss. As we watched, also, we could every now and then see a window on the right of the village thrown up and a machine-gun commence to fire on our advancing troops. It was all deliberate. The window was lifted, the gun was placed and fired. Just as deliberately the gun was removed, the window was closed, and the man disappeared. It was a supreme piece of gallant bravado, with a strong element of humour. Later on we found the window, and were not surprised that the house-walls were riddled through and through with our bullets.

The advanced station at Beshshit had during all this time a task which tested it to the utmost. It was thirteen or fourteen miles in front of its parent ambulance, which was still immobilised on the Gaza road, and it had to evacuate its wounded to one of the other ambulances of the division at Esdud. It was only by the most strenuous endeavour, and a spirit of quiet resoluteness undimmed by circumstances that often threatened to overwhelm him, that the commanding officer of this section organised his resources and averted disaster. Pressing into his service every passing vehicle, and straining his camels and mules to the limit of endurance, he kept the backward flow unbroken and the battlefield cleared of wounded. An occasional convoy of empty motor lorries was a welcome aid, as they passed Beshshit on their way back to their refilling point, to reload with stores and ammunition for the mounted troops. These had by this time swung over to our left flank to help in the pursuit of the Turk. Motor ambulance cars carried off the most serious cases.

By dawn on the 14th November the main station was clear of patients and, getting on the move, it did not halt till it had covered the long distance of fourteen miles or so to Beshshit, where, in the early afternoon, it joined forces with the forward station. In a short time a new ambulance camp sprang up on the

low ground beside Beshshit and, even before it was pitched, it was receiving casualties in considerable numbers from the other brigades of the division, but chiefly from the mounted troops on our flank, for whom, like us, the distance from their base was nearing breaking-point. There is a law of ambulance work which lays it down that wounded men, no matter whence they come or to which division they belong, must receive at all times an open door. During these days a sand-cart or camel convoy, loaded with cavalry casualties, often turned its course towards our flag, which they had espied afar off. Their hearts were glad as they unloaded their patients at our doors, after hours of weary wandering in search of their own ambulance, which by this time was probably many miles away. After a rest, and a drink and feed for horse and man, they set off again refreshed to search for their own people.

During these battles the transport section of the ambulance performed miracles of endurance. In moving warfare the most important part of a field ambulance, the part on whose services the success of the whole work vitally depends, is the transport. If the mules or camels or wagons fail, the ambulance becomes derelict by the wayside. It was fortunate for us that we had been continually enjoined in the preceding months to watch over our animals with a most jealous eye. We were continually exhorted to guard our horses and mules and our camels with the greatest care, and, under the skilled and constant supervision of the veterinary officer of the division, we had brought our animal flesh to a state of sturdy vigour and glossy health.

It was well for us that we embarked on our new campaign with our transport in as good a state of preparednesss as we had ever known. There were no better animals in the whole army. When the occasion came, the days of previous thought and effort found their reward in ample measure. From the time of Hesi right on to the days succeeding Katrah and Mughar the demands made upon horse, camel, and men were often extreme. We calculated that for several days on end, so stretched out were the lines of communication, each team of sand-cart mules did forty-five miles a day, often a great part of the time over soft and difficult country.

Our animals suffered. Some collapsed from exhaustion and were shot. Any other outcome of such strenuous days could not be expected. But, despite it all, at no time did we ever experience a serious breach in the ambulance work due to a transport break-

down. It was a hard task the warrant officer and the N.C.O.'s and drivers had to carry on, often under circumstances of great stress, but they managed it, and to them the maintaining of the chain of evacuation in an unbroken state was largely due.

XVII. Lull in the Storm.

The next few days were spent in the reorganisation of our stretched-out lines of communication, in the accumulation of supplies and stores for the next forward thrust, and in rest. Strained muscles and minds were indulged with relaxation and with sleep, and for the first time in many days the men found themselves able to settle down to the enjoyment of meals unlikely to be disturbed.

After days of unceasing trek the greatest joys the world can offer are a good round meal and a good sound sleep. And in the whole range of earthly enjoyment few pleasures are so great and so all-complete as those which we derived during these days from the satisfaction of these simple demands of nature.

Bully beef, tea, jam, and army biscuits were our fare for weeks on end, and a right good combination they make, especially when the "bully" is streaked with fat and the biscuit is crisp and mealy. To get the full benefit from the beef you must turn it completely out of the tin and cut in slices ever so thin. Never offer, in an outburst of excessive grace, to open the tin, for the patent key affixed thereto has only been known to work once or twice in a whole campaign. Tell off one of your number specially equipped with the virtues of patience and self-control for this meal-time duty, and by the end of the campaign he will turn you out your beef with quite creditable ease and speed.

Every now and then, when we came near a village, a special party would be sent to forage for additions to our table, and if they were lucky in winning the good graces of the village headman or sheikh they would often return with a goodly store of vegetables and flattened loaves of native bread, which you would turn from in horror in ordinary times, but which was to us then a delicacy. On rare occasions a few small eggs would grace our simple board, for poultry was scarce everywhere throughout the country. Now and then an ox or sheep came our way, though you had to pay dear for them. Young oxen were rarely seen, and, as a matter of fact, most of the necessaries of life were scanty after the occupation of the Turk. They seemed to us more scanty than

they in reality were, for, fearing the confiscation of their goods, the natives contrived to hide away in a manner wholly remarkable the greater part of their movables. Large quantities of food and forage were concealed in this way. Though we lived on the country, it was only to a very limited extent. Our chief supplies came up from behind, all the way from Egypt.

The village of Katrah, before which we lay these days, had some points of interest for us. It stands on an eminence which rises abruptly from the surrounding country, like the village of Mughar, which is about one mile to the north. The two villages first come into view after you have climbed the slopes which rise by gentle gradients from Esdud, and which fall away again northwards and eastwards into the plain. As you stand on the summit of this high ground and look over the plain, the twin villages in the foreground, placed side by side on their commanding eminences, present a striking appearance. Behind them the flat ground extends in an unbroken stretch of fifteen miles or thereby to the ridge of the Judean mountains, which run north and south across the entire horizon, and form the massive eastern boundary of the Syrian plain. Hidden away from view in its upper recesses, almost on a level from where we stood, we knew that Jerusalem was placed.

When we first saw Katrah we were impressed by the unusual character of the buildings that went to form the southern part of the village. Later we learnt that there are in reality two villages, the native village proper consisting of the usual flat-topped, closely packed mud huts, which look a dull grey from the distance. The other village consists of a small but thriving Jewish colony, the inhabitants of which are chiefly of German or Russian origin. Unlike the adjacent village of dull appearance, the houses in the colony are built on European lines, with white or coloured walls and red roofs. Each dwelling has its trim garden, and scattered trees complete a picture of considerable charm and beauty. It was the first of a considerable number of Jewish colonies which we were to see. It left its impression as being a distant outpost of culture and activity strangely welcome amid surroundings of Oriental squalor and decay. There is actually a German hotel in the place, which some of us visited, whilst our commissariat was reinforced by the purchase of some good Jewish bread.

An event of considerable importance to us at this time was the addition of a Syrian doctor to our staff. He was captured with the battalion of Turkish soldiers taken at Katrah, whom he had

served as medical officer. He had been educated at the American college at Beyrout, and spoke good English. During his stay with us he proved invaluable in assisting in the treatment of the wounded natives and prisoners whom we received. He was a man of handsome appearance and of considerable charm of manner, and we were loath to part with him when orders came to send him down the line.

We were meanwhile expecting the order to pack up and move at any moment of the night or day. The respite was enjoyed by everyone to the full, but it could not last long, for there was still a Turkish force in front of us which we dare not allow to recover from its headlong flight until Jerusalem was in our hands.

We were still uncertain as to how things were going on the right flank, and we wondered if we were waiting for developments there. Nearer at hand, we knew that one of the brigades of our own division, by a forced march, had cut the Beersheba to Jerusalem railway line, the Turks' main communication, at Mansura.

On the afternoon of the 18th the order came: "Pack up and move off at once behind the brigade to Ramleh." The advanced station was off within the hour across the plain, to fall in behind the long infantry column, which could be seen already marching northwards past Katrah and Mughar.

The remainder of the ambulance followed close behind. The whole march was carried out in a night as black as pitch, and before we were long on the road the rain poured down in torrents, and what was at the best of times a soft cross-country track was soon transformed into a slippery surface of deep mud. We had with us a reliable native guide, coaxed to face the elements of the night by the promise of a shilling and a tin of bully beef.

It was for us a notable night, in which we often came very near disaster in steering our convoy over greasy wadi beds, but we won through, and, pushing our way into an orchard to shelter from the storm, we threw ourselves down on the ground to wait for day.

Soon after dawn the brigade got on the move and struck cross country straight for the hills, where the Turks were said to be in some force. Within an hour or two the foothills of the Judean range were reached, and, passing Annabeh, the brigade, with the advanced ambulance section, halted at Berfilya. It was joined on the next day by the remainder of the ambulance, which had spent the night at Ludd.

(*To be continued.*)

CLINICAL RECORD.

CASE OF DIVISION OF POSTERIOR NERVE-ROOTS OF BRACHIAL PLEXUS.

By Sir MONTAGU COTTERILL, C.M.G., F.R.C.S.E.,
Lt.-Col., R.A.M.C.(T.).

Lieut. J. T. R., attached R.A.F., aged 29, was admitted to the Officers' Ward in Craigleith Military Hospital on the 14th of September 1918.

Whilst trying to start his aeroplane he was struck by the propeller, and was admitted to hospital a few hours later, suffering from (1) a compound comminuted fracture of the right humerus, and (2) a simple extra-capsular fracture of the left femur.

The right arm had been almost completely severed. The bone was comminuted, and the muscles, skin, and vessels all divided. The arm was hanging on by the median and ulnar nerves, which were the only structures which were not torn through. Amputation was performed through the upper third of the humerus. There was practically no bleeding whatever, and the only vessel tied was the main artery, in which there was no movement, and from which no blood was escaping. It was noticed that there was no pulsation to be felt in the axillary artery. The fractured thigh was put up in a Thomas splint with extension.

Though we had some anxiety in regard to the vitality of the flaps, the amputation wound healed by first intention in a few days.

Ten days after the operation he began to complain of severe pain in the hand and arm which had been removed, and in the right shoulder. It was noticed that the right pupil was firmly contracted, and did not dilate. His leg was put up with a Balkan frame.

On 10th December, as the pain continued severe, I asked Captain Edwin Bramwell to see him with me. Captain Bramwell considered that he was suffering from traumatic neuritis of the right brachial plexus, and probably some tearing above the region of the sympathetic plexus. Morphia, $\frac{1}{6}$ gr., was ordered to be given night and morning.

While slight temporary relief was given by the morphia, the pain continued very severe during the early weeks of 1919. Other sedatives were tried, but no real benefit followed, and his health suffered somewhat from continued suffering and loss of sleep.

The question of operation now arose, and Captain Bramwell and I agreed that the only course was to divide the posterior roots of the brachial plexus by a cervical laminectomy.

The severe nature of this proceeding was fully laid before the patient, with the view of obtaining from him a precise and unexaggerated estimate of the pain he said he was suffering. He promptly asked for the operation to be done at once, and said that he was prepared to take any risk.

The operation was accordingly done on 11th April. The laminæ of the fifth, sixth, seventh cervical, and first dorsal vertebræ were removed, and the dura opened by an incision of about six inches in length. By attending to a proper position, with shoulders raised and head hanging over the table, very little cerebro-spinal fluid was lost. The posterior roots (fifth, sixth, seventh, and eighth and first dorsal) were thus exposed. It was very interesting to note that the sixth cervical root had been completely torn through, and the stumps of the torn root could be seen issuing from the cord. The fifth, seventh, eighth cervical and first dorsal roots were then divided, and steps were taken to prevent their cut ends from coming in contact.

The incision in the dura was then closed by very fine catgut, and the muscles approximated by several deep stronger sutures.

The wound was completely healed in eight days, and the patient reported himself as much relieved of pain, though he still had a "gripping" feeling in the hand.

A fortnight after the operation he was allowed to get on to a sofa, with a poroplastic support for the neck.

A month later he was transferred to the Canadian hospital at Buxton; and now he has gone home to Canada. The last report was to the effect that he was quite well and free from pain.

There are two special points of interest, both tending to show the severity of the original injury. The first is the tearing through of the sixth posterior root; and the second is the fact that at no time after the accident could any pulsation whatever be felt in the right subclavian artery as it passes over the first rib. The carotid vessel pulsated normally.

At the operation, and in the after-treatment, I had most valuable assistance from Captain George Millar, R.A.M.C.

CRITICAL REVIEWS.

THYROID HYPERPLASIA.

By CHARLES M'NEIL, M.A., M.D., F.R.C.P.(Edin.)

THYROID hyperplasia is usually regarded as opposed to the colloid enlargement of the gland in chronic goitre. In hyperplasia there is a softening of the gland, due to the reduction of the colloid material; enlargement may or may not be present. In the colloid goitre there is hardening with enlargement, owing to the increased storage in the gland of the firm colloid material. But hyperplasia, as Virchow pointed out, is the primary phase of every goitre. Colloid goitre is the sequel of hyperplasia; so that any discussion of the cause and pathogenesis of thyroid hyperplasia must include all conditions of goitre, hard or soft.

Exophthalmic Goitre.—In a series of papers, Marine and Lenhart have recorded their extensive investigations upon thyroid hyperplasia in man, supplemented by experimental observations upon animals. These papers form an important addition to our knowledge of the thyroid gland in health and disease. They especially deal with the subject of exophthalmic goitre.

The following data are collected from these papers.[1, 2, 3] Thyroid hyperplasia often accompanies the physiological states of puberty, pregnancy, and lactation. The thyroid gland is normally larger in the female than in the male: it is also relatively larger in the child than in the adult. The normal weight of the thyroid is from 20 to 30 grms. Careful determinations of the iodine-content of the thyroid are given. This is greatest in colloid glands, and is least in hyperplasia, varying inversely with the degree of hyperplasia. In a series of twenty-three normal human glands the iodine per gramme of dried gland ranged from 3·6 mgrms. to 1·3 mgrm. In hyperplasia, which by the test of histological examination may be slight, the iodine-content is far below this minimum—about 0·8 mgrm.—and the authors affirm that the iodine-content begins to fall some time before there is any visible histological change in the gland. They record experiments upon both men and dogs to show that histological hyperplasia can be both prevented and cured by the giving of iodine, and conclude that iodine is an active, perhaps the most active, constituent of thyroid secretion.

As to the cause of thyroid hyperplasia, at least three views have been held: that of a disturbance primarily originating in the thyroid (Moebius): the result of specific infectious agency (Virchow,[6] Farrant,[7] M'Carrison): the result of nutritional and metabolic changes produced

by a great variety of causes. This last view has been steadily gaining ground and is supported by Marine and Lenhart. It is not incompatible with the second view and may indeed include it.

Thyroid hyperplasia is present in many and widely differing morbid conditions, and something will be said of these in a later paragraph. And it should be remembered that it may occur without clinical symptoms of disease (Hale White [8]).

Its occurrence in the physiological states of pregnancy, menstruation, etc., has already been alluded to.

But the classical example of thyroid hyperplasia is to be found in exophthalmic goitre.

Exophthalmic Goitre.—It is now a firmly established fact that thyroid hyperplasia is an essential part of the morbid anatomy of exophthalmic goitre and varies directly with the acuteness of the disease. The most widely held opinion is that the thyroid secretion in ophthalmic goitre is excessive in quantity, and morbid in quality. Greenfield [9] held that exophthalmic goitre was a primary disease of the thyroid, and that its excessive secretion, though possibly not the sole and essential, was the principal factor in the condition. This view is chiefly based on the fact that the giving of thyroid gland or of iodine-containing compounds in exophthalmic goitre aggravate the symptoms, and also on the beneficial results of partial removal of the thyroid in cases of the disease. The view of Marine and Lenhart [3] is that "the essential physiological disturbance of the thyroid is insufficiency, its reaction compensatory, and its significance symptomatic." They place the primary origin of the disease in nutritional and metabolic disturbances, which may be produced by a variety of morbid conditions. The insufficiency of thyroid secretion is held to be proved by the low iodine-content of the gland in Graves' disease, though this does not conflict with or weaken the statement of the opposing school that the gland secretion is excessive in quantity and morbid in quality. The reversion of the hyperplastic gland to the colloid condition on the exhibition of iodine does not seem to lend weight to either theory, but simply shows that in exophthalmic goitre the storage of iodine in the thyroid has ceased. It is quite possible that in exophthalmic goitre there is an excessive and morbid thyroid secretion, but that the cause of this does not originate in any vice of thyroid activity but in some obscure and general disturbance of the body protoplasm generally. This latter view is supported by the evidence of experimental thyroid hyperplasia in animals and in man, and also by another important feature of the morbid anatomy of exophthalmic goitre, namely the lymphoid hyperplasia.

The occurrence of enlarged and persistent thymus in cases of exophthalmic goitre was noted by Markham [10] in 1858, and has never been lost sight of since. It has become a more and more prominent feature

of the literature in recent years (Berry,[11] Halsted[12]). Mackenzie,[13] in the Bradshaw Lecture, 1916, found enlargement or persistence of the thymus in twenty-six out of thirty-six post-mortem examinations on his own cases of exophthalmic goitre. In a larger series of sixty autopsies, Capelle[14] found thymus persistence or enlargement in 79 per cent. He ascribes some essential but unknown *rôle* to the thymus in exophthalmic goitre, and says that the severity of the disease can be measured by the degree of its enlargement. Hanseman[15] thinks that the thymus enlargement is caused by the morbid thyroid secretion, while on the contrary Hart[16] takes the view that the thymus toxin starts the thyroid hyperplasia. Marine and Lenhart[1] agree that lymphatic hyperplasia is present in all severe cases of the disease, but that, like the thyroid hyperplasia, it is secondary to more fundamental causes. They believe that the thyroid and lymphoid changes together form the best indices of the severity of the disease.

The blood-picture in exophthalmic goitre—a relative increase of lymphocytes with a corresponding reduction in polymorph leucocytes—would seem to be a part of this lymphoid hyperplasia.

The much heavier incidence of exophthalmic goitre in females as compared with males (about 10 to 1) is a striking fact, and corresponds to the greater liability of the gland in women to physiological hyperplasia; it supports the view of the secondary character of the thyroid change in exophthalmic goitre. It corresponds also to the greater frequency of simple and endemic goitre in women.

We may note at this point the remarkable age incidence, in the practical absence of the disease from the period of childhood. Of 438 cases collected by Mackenzie,[13] only 2 were under 15 years of age. That figure is representative of other statistics on this point. And yet this is the period of life in which thyroid and lymphoid hyperplasia do occur fairly often in the pathological syndrome of status lymphaticus. Comment on this is reserved for a later paragraph.

In some of the older writers the view that the thyroid change in exophthalmic goitre was due to infectious agency was held. Farrant[17] has recently strongly urged this view. He maintains that the thyroid change is the result, not of a single toxæmia, but of a combination. The first infection produces a simple thyroid hyperplasia: a superadded infection is required to produce exophthalmic goitre. In a previous paper,[7] he brought forward experimental evidence that thyroid secretion plays a definite antitoxic *rôle*. In a series of animal experiments, animals given more than a lethal dose of diphtheria toxin, and also fed with thyroid extract, either survived or outlived control animals to which thyroid substance had not been given. This evidence is not conclusive, as the interaction of the thyroid substance may have been with the animal protoplasm and not with the bacterial toxin; but it is a complete demonstration of the fact that thyroid activity in some way

aids the body in counteracting bacterial infections. Farrant gives a lengthy list of bacterial diseases in which thyroid hyperplasia is present, but excepts from it the staphylococcus, streptococcus, and pneumococcus, while in two cases of typhoid fever of four and nine weeks' duration there was only negligible hyperplasia. But apart from clinical evidence not definitely conclusive, he gives no convincing proof of infective origin in exophthalmic goitre.

In the literature of exophthalmic goitre, psychical factors such as fright, anxiety, and long-continued mental strain, take an important place. Mackenzie [13] found such a history in about one-third of his cases. The war has added to the list of cases of hyperthyroidism and even of definite exophthalmic goitre, apparently produced by severe mental strain or extreme physical exhaustion. Such cases have been described by White and Hernaman-Johnson,[18] Bérard,[19] and Major W. Johnson.[20]

Endemic Goitre and Simple Goitre.—Though endemic goitre is probably a definite clinical entity, being thyroid enlargement and hyperplasia produced by a specific cause, while simple goitres may be due to widely different causes, the conditions may be considered together as being goitres unaccompanied by definite general disturbance of health.

Berry [11] insists on the independence of exophthalmic goitre and goitre, pointing out that although Graves' disease may follow a previous goitre, the former disease is not more common in districts of endemic goitre than it is elsewhere.

The investigations of M'Carrison [21] on endemic goitre as occurring in the Chitral and Gilgit districts of Northern India have greatly increased our knowledge of this world-wide disease. Here the crowded native population—poor, badly fed, living in crowded insanitary huts, and tilling the soil—showed a high degree of endemic goitre. The clinical features of the goitre were identical with the endemic goitre of the continent of Europe, of parts of the British Islands, and of the lake basin district of America. It also occurred in British troops quartered in the district. A series of experiments, carefully controlled, were carried out by giving to human beings the deposit from drinking water suspected of causing goitre. In all 36 persons took the unboiled sediment daily for a number of days; in 21 there was no result; in 10 there was notable thyroid enlargement, and in 5 there was transient swelling. All the 31 controls, using the boiled sediment, gave negative results. The positive results included M'Carrison himself, who in 15 days developed a goitre with 2·5 cm. enlargement of the circumference of the neck.

But that drinking water was not the only cause of the disease was shown by the occurrence of goitre in individuals using only boiled water. Definite therapeutic results were obtained by the use of thymol.

This, given twice daily in 10-gr. doses, cured sixty-eight out of eighty-two goitres so treated—a result strongly suggesting that endemic goitre was due to some *contagium vivum* ingested either with food or water, residing in the intestinal tract and producing the goitrous intoxication by intestinal absorption. Vaccines prepared from the fæces of goitrous persons, either composite, or from B. coli, or from spore-bearing intestinal bacteria, also effected great improvement in goitres. M'Carrison therefore concluded that in Chitral and Gilgit endemic goitre was due to soil polluted by the fæces of men and animals, and was conveyed to man by water and to a less extent by food. The disappearance of endemic goitre from districts in Britain and the continent of Europe after the purification of water supplies and improvement in general hygienic conditions lends strong support to the view of a living virus resident in the soil, and producing goitre by its transference to the human intestine.

Attempts to produce goitre in animals have been difficult. Giving goats fæcal-polluted water, M'Carrison produced slight thyroid enlargement. He refers to equally indefinite results obtained by the Swiss Commission on Goitre with dogs, rats, guinea-pigs, and monkeys, but mentions successful results obtained in rats by Bircher and Répin.

M'Carrison states that, in cases of endemic goitre, the lymphocytes of the blood are increased, the blood-picture thus resembling that in exophthalmic goitre. Marine and Lenhart[1] amplify this by stating that in all clinical forms of goitre, though most markedly in exophthalmic goitre, there is an hyperplastic reaction of all the lymphoid tissues as well as of the thyroid.

Thyroid Hyperplasia and Status Lymphaticus.—The great frequency of lymphoid hyperplasia in exophthalmic goitre has already been noted, and the morbid anatomy of the clinical entity may be described as a coexisting lymphoid and thyroid hyperplasia.

Exophthalmic goitre is an exceedingly rare disease under the age of 10, while the obscure condition described as status lymphaticus, and characterised by sudden death from trivial causes, occurs most frequently under the age of 5 years. Evidence is accumulating that, in status lymphaticus, lymphoid hyperplasia is accompanied by morbid change in many other tissues, and especially that thyroid hyperplasia is often present. Wynn,[22] in a series of twenty cases of status lymphaticus, found marked thyroid hyperplasia. The present writer[23] examined the thyroid in twelve out of thirteen cases of sudden death in young infants with thymo-lymphatic hyperplasia, and in every case marked thyroid hyperplasia was present. In cases also of fulminant acute fevers, pneumonia, and scarlet fever, autopsies showed the same conjunction of thyroid and lymphoid hyperplasia. Out of Warthin's[24] forty-one cases of status lymphaticus, death took place very rapidly in twenty-two cases from intercurrent affections. While Daut[25] has

published a series of twelve cases of fatal and fulminant diphtheria, associated with status lymphaticus.

In view of these suggestive resemblances, it is interesting to place alongside one another exophthalmic goitre and status lymphaticus as analogous morbid conditions of body occurring at different age-periods. Each is characterised by thyro-lymphoid hyperplasia, and in each death frequently takes place rapidly from the complication of some shock or intercurrent illness.

In the case of exophthalmic goitre the lymphoid hyperplasia is at last receiving widespread notice as an essential feature of the morbid anatomy. While as to status lymphaticus, the evidence is growing stronger that thyroid hyperplasia is an equally important feature.

Thyroid Hyperplasia and other Morbid Conditions. — Marine and Lenhart[1] give a list of other diseases in which lymphoid hyperplasia has been noted—rickets, chlorosis, cretinoid states, osteomalacia: in almost any prolonged infectious disease—syphilis, tuberculosis, typhoid fever, acute rheumatism: also in abnormally fat children and in adiposa dolorosa.

They also have published observations on goitre occurring in brook trout kept in hatcheries.[26] They excluded infectious agency in this disease, and believe the cause to be overcrowding and overfeeding. The disease does not occur, they say, in trout living under natural conditions.

They also describe a condition of endemic goitre in dogs, sheep, and cattle in certain districts.[27]

Conclusion.—Thyroid hyperplasia is therefore seen to be a very widespread condition both in man and animals, and associated with a considerable variety of morbid conditions.

In endemic goitre in man, investigation has brought us almost within sight of the primary morbid agent—one or several intestinal bacteria ingested with food or water from polluted soil.

In exophthalmic goitre it is in the meantime a good working hypothesis to assume bacterial agency.

But in all cases of thyroid hyperplasia, we seem to be dealing with a single biological reaction of the gland to a variety of original morbid causes. These morbid agencies would seem to exert their effect in the first place upon the general living protoplasm of the body tissues: and the hyperplasia of the thyroid, as of other ductless glands and of the lymphoid tissues, would seem to be produced as a reaction to changes as yet quite obscure and imperceptible in the body tissues.

References. — Marine and Lenhart, [1] *Arch. Int. Med.*, 1909, iv. 440. [2] *Ibid.*, 1911, vii. 506. [3] *Ibid.*, 1911, viii. 265. [4] *Journ. Exp. Med.*, 1910, x. 311. [5] *Arch. Int. Med.*, 1909, iv. 253. Virchow, *Die krankhaften Geschwülste*, 1863. [7] R. Farrant, *Proc. Roy. Soc. Med.*, November 1912, p. 21. [8] H. White, *Med. Chir. Trans.*, 1888, lxxi. 171. [9] W. S. Greenfield, *Brit. Med. Journ.*,

1893, ii. 1261. [10] Markham, *Trans. Path. Soc. Lond.*, 1858, ix. 163. [11] Berry, *Lancet*, 1913, i. 583. [12] Halsted, *Ann. Surg.*, 1913, ii. 178. [13] H. Mackenzie, *Lancet*, 1916, ii. 815. [14] Capelle, *Muench. med. Wochenschr.*, 1908, lv. 1826. [15] Hanseman, *Berl. klin. Wochenschr.*, 1905, 44a, 65. [16] Hart, *Muench. med. Wochenschr.*, 1908, lv. 668. [17] R. Farrant, *Brit. Med. Journ.*, 1914, ii. 107. [18] White and Hernaman-Johnson, *Lancet*, 1916, i. 78. [19] Bérard, *Bull. de l'Acad. de Méd.*, 1916, 28th November. [20] W. Johnson, *Brit. Med. Journ.*, 15th March 1919. [21] M'Carrison, *Lancet*, 1913, i. 147, 219, 365. [22] Wynn, *Green's Encycl. of Med. and Surg.*, ix. 329. [23] M'Neil, *Edin. Med. Journ.*, January, July, August 1914. [24] Warthin, *Arch. Pediat.*, 1909, 597. [25] Daut, *Jahr. f. Kinderheilk.*, Bd. xlvii. 147. [26] Marine and Lenhart, *Journ. of Exp. Med.*, 1910, xii. 311. [27] Marine and Lenhart, *Arch. Int. Med.*, 1909, iv. 253.

FREUDISM.

By T. A. ROSS, M.D., F.R.C.P.(Edin.).

MANY papers have been written on the Freudian doctrines and another may seem unnecessary: but these have tended either to accept the whole conception almost without criticism, or else they have been actuated by undisguised hostility, and have shown the grossest misunderstanding of the ideas of Freud—a misunderstanding which in many instances cannot be looked on as other than wilful. It is possible, therefore, that another article on the subject may not be out of place.

The debt which psychological medicine owes to Freud is large. His view of the unconscious and his methods for exploring it have been of great value. But he, and still more his followers, have used the word "always" when "sometimes" would have been more appropriate; and the extensions which they have given to their method of investigation have been much more than is strictly legitimate.

The whole Freudian doctrine is one of considerable complexity, and though its literature is enormous, there is no book in English which gives a complete succinct account of it. This is not a reasonable ground of complaint, for it is still in a process of growth, and its adherents are busily occupied with this. But a good deal of misunderstanding might be swept away if a book up to date were published. At present it is difficult for one not practising Freudian psycho-analysis to get the matter into focus. The Freudians indeed say that such an one cannot be expected to do so, and that he has no right to criticise that which he has not tried. They say that those who wish to find out about it

must try it, and that when one has tried it honestly, its truth will become apparent. But when the names of some eminent psycho-analysts are mentioned—workers who began with Freud, who did psycho-analysis faithfully and who then differed from Freud very considerably—it is suggested by some of Freud's followers that that shows that they never did practise the methods properly. This argument in a circle is one that constantly turns up when an investigation into Freudism is being made, and this is another reason for the great difficulties encountered in investigating the subject. Moreover, the invitation to practise before criticising is really a little absurd: one criticises books, food, pictures, plays though one can neither write, cook, paint, nor act; and no one challenges the right to do so. Further, to analyse one patient takes about a year, giving an hour a day. No one would care to express an opinion from one case. Suppose—seeing that the study is to be intensive—one contented oneself with fifty cases, working eight hours a day one might in six years begin to form an opinion as to whether the subject was worth pursuing or not. *Ars longa* this with a vengeance.

There are two aspects from which these doctrines must be considered:—(1) Do they form a satisfactory explanation of the neuroses? (2) If they do, are the methods employed the best to help patients suffering from these disorders?

First, then, as to the truth of the doctrines. We shall examine the chief of them, and endeavour to see how far they are credible.

1. The cause of a psycho-neurosis is mental, not physical. This will not be disputed seriously anywhere now. It is more a matter of definition than anything else. If chronic fatigue exists, it is not a psycho-neuroses, but an affair of chemistry; if there be such a thing as sub-infection, the results are clearly not a neurosis at all but a toxæmia. This mental doctrine is not a Freudian discovery. In its entirety it was taught by Dubois. The laity have always known it. There is a good case described in the Book of Tobit.

2. The mental factor which is the cause of a neurosis is always in the unconscious. This is a cardinal point. It has been supported by a great wealth of clinical evidence, and that a seemingly unconscious mental factor may be and very often is the cause of a neurosis is indisputable, but that it must always be so seems a hard thing to prove. Let us take the common anxiety state that everyone is now familiar with as exemplified by the soldier. He has had several dreads which are often fully in

consciousness—the dread of death, the dread of leaving his wife and family unprovided for, the thought of dying without seeing them, above all the thought that the very occurrence of these ideas has constituted cowardice. With the close of the war the fears will have disappeared, but the shame of the last thought may easily persist, and be quite capable of causing many symptoms such as insomnia, headache, shyness with people, inability to concentrate, etc. Get the patient to view it in another light, get him to see that ideas of the sort were common to everyone, and that their mere possession was not synonymous with cowardice, and he will in nine cases out of ten become and remain well. And yet the Freudian will say that he could not have had a neurosis from these causes if they were in consciousness, that there must have been another and unconscious factor before it could have occurred. The proof he will offer will be that if the patient be now analysed, there will certainly emerge forgotten incidents of a distressing nature with a strong emotional tone, the so-called complexes, which will be painful to elicit, which must therefore have been possessed of energy and which must in consequence have been causal in the production of the symptoms. This is, it is believed, a fair exposition of the Freudian position. It is not difficult to see that it is full of fallacies.

There has been a great deal of talk of the energy ("libido" of Jung) which ideas possess. We are to imagine these repressed ideas, shut out of consciousness, trying to get there, failing and bursting out as it were sideways in the form of a symptom. Now if we are speaking scientifically, as we should be, is it to be taken for granted that an idea possesses energy? An idea can be conceived as releasing energy, but unless we are prepared to dispute the law of the conservation, we shall do well to be very chary in our use of the word, to remember at any rate that we are using it metaphorically. Energy resides in physical things only. The idea is merely the trigger which will allow of the explosion, and it is hard to think of a trigger struggling to assert itself.

The significance of finding a complex is *per se* nil. Every person has incidents in his life which he has suppressed, which he has totally forgotten, and which he cannot remember by any voluntary effort, but which can be revealed by psycho-analysis. Anyone who will analyse his own dreams will soon convince himself that the number of incidents and thoughts which he supresses every day is enormous. If the power of these complexes were all that it is supposed to be, there should be far more serious

neurosis than there is, or else the mind must have some highly satisfactory method of dealing with them. The Freudian says that it has such a method, the method of sublimation, the transforming of the hypothetical energy to some altruistic work. For the purpose of understanding this, let us believe for a moment in the view of energy being resident in thought. Our soldier before he fell ill was sublimating the energy of all the complexes he ever had. He was doing the most altruistic work that man can perform—going about ready to lay down his life for an ideal. Later, when he fell ill, he was no longer sublimating; his one idea now was to get out of it, and in consequence all his complexes had their energy dammed back and symptoms ensued. Against this it may be pointed out that many soldiers have continued for months on duty at the front with insomnia, headache, fatigue, and all the other classical symptoms. Surely these men were sublimating, more so indeed than their healthy comrades, yet they had these symptoms.

Under what circumstances, then, does the idea release energy? Despite all that has been written, it is surely when it is in consciousness, when it is associated with striving, positive or negative, with craving or aversion. Repression and suppression seem to be normal methods of getting rid of undesirable cravings or aversions; and it is only when the complex is wholly or partly in consciousness, or associated with other constellations of ideas which are wholly or partly in consciousness that symptoms occur. If this is correct, then symptoms would mean that suppression was not complete; and we might predicate the very opposite of the Freudian dictum, and say that the idea can cause symptoms only if it is in consciousness or associated with something that is. The action of the censor becomes more intelligible with such a view. It is not that the censor dams back the complex which then causes an explosion, but that there is a selection, and the symptom is chosen rather than the complex as being less intolerable. This choice is a thing seen constantly on the physiological side. When one is concentrated one does not hear a ticking clock. It is not chosen. Head has pointed out that if one dips one's hand in warm water, then in hot, then back to the warm, the latter now feels cool, not warm. Therefore the cold spots were capable of being stimulated by that degree of heat, but their stimulation the first time was ignored, not chosen. There is nothing, therefore, bizarre in this idea of choosing or rejecting one of two thoughts; and probably for that patient an idea that he is ill or going

insane is much more tolerable than the thought he is trying to suppress.

The more the matter is looked into, the less does it seem necessary that the causal ideas of symptoms may not be fully conscious, and therefore the less does it seem necessary that a complete psycho-analysis should be made. The object of finding the idea that is causal is to get the patient to look at his trouble in a different light, and it is therefore necessary to find it and discuss it: it may be in full consciousness, or it may be out of the focus of attention, and the great value of Freud's teaching lies in this that he has insisted that we should be prepared to go on looking for it till we find it. The Freudian says that it is not the discussing of the difficulty that cures but the mere finding of it, that only a complete analysis can make sure of curing, for with a complete analysis the patient will have all possibilities of emotional reaction removed, there will be nothing that can explode. It is a difficult thing, that complete analysis. We are told that Freud still analyses himself for an hour every day. If after all these years the master has not yet finished his own case, what chance has any doctor with any patient?

3. The next point in the Freudian doctrine is that the suppressed complex is always sexual: this is hailed as a great discovery; but it is obviously a corollary from the previous doctrine that suppression is a *sine qua non*. Sexual desire is normal to all, but the individual who fails to suppress it goes to jail or the asylum or suffers social ostracism. Therefore in everyone, not in these categories, it can be found by analysis. It need not be disputed that a large number of the neuroses have a sexual origin. The longings, the sorrows and the remorse with which this great force of sex love is associated would make it certain of being a frequent causal factor in the conditions under discussion. But that because sexual suppression is found it is therefore of necessity the cause of the neurosis under consideration is obviously not true.

4. The complex is infantile. This in a sense is perfectly true. Just as the shape and structure of our bodies in adult life depends on what they were like in infancy, on what happened to them in infancy, so is the trend of our adult minds dependent on our infantile psychical environment. If we have rickets in childhood, our misshapen thoraces may trouble us in after life. If we have been subject to a bad psychical environment in early childhood, it must have some effect later. Now if the complex is always sexual

and also always infantile, it is obvious that the thoughts of infants who later become the subject of a neurosis must be sexual. The view that is actually held is that a large part of the mental life of every infant is sexual. The proof which is offered for this statement is difficult to get, but as far as I am able to trace it, it is something like this. An adult patient by association is brought to remember that as a child he disliked his father, he may even get a conscious memory that he wished to lie in bed with his mother and that his father opposed this. All this is possible and believable. The patient having got so far, continues to go on with his associations, and if such a subject is pursued long enough without reserve or criticism of any kind—and this is the essence of free association—the idea will in some cases come into the mind of the adult being analysed that the object of lying in bed with a woman is sexual. Therefore the patient as a child had sexual wishes with regard to his mother. It is immaterial whether this comes as an actual recollection of a childhood thought or not; if it does so come, good; if it does not so come, good again; for in that case it is the raising into consciousness of a thought which had existed in infancy, but then in the unconscious only, where however its validity was as great as if it had existed in consciousness.

To most people this kind of argument savours of insanity; if it were true, then from the interplay of our thoughts no new thought could ever arise, but only the emergence of old thoughts. It presupposes also exact physical knowledge of the sexual act on the part of the infant. One could in this way prove anything one wished to. Observe that the result is achieved by the patient alone: the analysts say that they never suggest anything, that their sole function is to keep the patient going on with his associations. Many people who have attacked psycho-analysis have accused the Freudians of putting ideas into people's heads, and the analysts have been able to say with truth that they do not. But urge anyone on with free associations and thoughts of that kind are bound to come up.

Although the proof that the infantile mind is sexual is largely as stated above, the Freudian will next say that his view of the word sexual is much broader and wider than that ordinarily held, and that in any case the sexuality of the infant means something quite different from that of the adult. And if this is true, then the above proof of the idea of infantile sexuality becomes valueless, and if we mean something quite different from adult sexuality, it

would be rather better to use another word: to this the Freudians reply, Ah! but it is of the same nature.

Having determined then that it is sexual, they proceed to bolster the theory up with analogies from the studies of primitive peoples. Just as our individual bodies reproduce rapidly the history of the race, so our minds do the same: therefore we should find much in the minds of primitive peoples that is the same as in the minds of infants. And as we find in infancy unconscious sexuality, so we will find in the adult savage unconscious sexuality. When the subject of tabus is studied, it is fairly clear that many of them are directed against incest; and as there are no laws unless people wish to do the thing legislated against, it is clear that though wish for incest may not exist in the savage now, it must have long ago; and therefore he has an unconscious sexual wish, kept down by the fear of the tabu. This then is additional proof of the sexuality of the children of civilised people! Surely there is the difference, that even so long ago as when these tabu laws came into existence the people who made them did understand the sexual act, and the infant does not.

The view that the complex is infantile is believable to the extent that we cannot be too careful of the psychical environment of quite young children; but not to the extent that a baby has incestuous desires towards its mother. We all know that a baby desires its mother's nipple, but the end in view is not sexual but that another instinct may be gratified—that of self-preservation: and through life there seems much evidence that this latter instinct remains the predominant one. From time to time we do hear of those who gave up the world for love; but how few have they been compared with those who gave up love that they might be sure of meat and drink, of position and power, of leisure and money.

We have examined briefly the main points of the Freudian theory, and have seen that much of it is true, but that its adherents seem to have let it run away with them. It remains to consider whether the Freudian practice is the best method of dealing with the psycho-neuroses. This resolves itself into the questions: Is free association the best method of obtaining forgotten ideas, and is it desirable to resuscitate those completely suppressed?

To carry out the method of free association the patient should lie on a couch fully relaxed in body; his eyes may be open, but he should have nothing to look on except the ceiling or blank

wall; the analyst should sit behind out of sight. The patient begins with some fragment of a dream, relaxes his mind, and says whatever comes into it, starting from the dream. A dream is usually chosen as the starting point, because it is already a piece of unconscious mental process, and because it has often also a strongly emotional tone. The patient must criticise nothing, and withhold nothing, but say whatever enters his mind. To the present writer this does not seem far removed from the hypnoidal state; the importance of this point will emerge later. It seems probable that whatever comes into consciousness, and is recognised as a memory of an event or thought which has happened before, may be regarded as true. But if an idea comes by association which is not a memory, but a feeling like that of the incest wish referred to above, then it cannot be safe to accept that as an index of what was thought long ago. We have no right to assume that it represents a memory which existed in the unconscious; it may equally well be an inference which is being made at the *séance*. If this precaution is taken of clearly differentiating between what is recognised as a memory and what is not, there is no objection to the method. But it is tedious and haphazard. There are simpler and more direct ways of getting at the complexes: the method, for example, of taking the symptoms one by one and directing the patient to think back about them, to try to remember when and where they occurred until their origin is arrived at.

The Freudians say that their method of treatment must be the best, because they have tried all other methods before they knew Freud, and that this method gives better results than those. But when one investigates what other methods are being referred to, it will be found that it is hypnotism, and hypnotism alone, with which comparison is being made. Hypnotism is probably the weakest of all the psycho-therapeutical measures; one cannot help feeling that if they had approached these illnesses from the point of view of Déjerine rather than from that of the hypnotists, they would have seen Freudian psycho-analysis in another light. Though they now denounce hypnotism, they have not escaped from it. Between free association and the hypnoidal state it is difficult to see any distinction. In both the critical faculty is in abeyance, intellectual control is deliberately done away with. To accomplish this is to hypnotise.

How then are we to account for the fact that psycho-analysis does good? On the way to turning out the entire content of the

mind it is bound to stumble on causal complexes. Discussing these even although other inert complexes are obtained also must be helpful. To bring these others to light, although it may cause pain for the time, will probably not do permanent harm. They did not cause symptoms before, therefore they will not now. As Morton Prince has pointed out, it is not merely the emotion, but the emotion in a particular setting that does harm.

Thus, in Tobit, Sara had no neurasthenic symptoms after the sudden deaths of her seven husbands until the servant suggested that she had strangled them. The events, at least the first one or two, must have been emotional, but it was not till the new setting was supplied that symptoms arose. In Freudian analysis there is the risk that with the revival of the old inert complex, a dangerous setting may be made; this would account for those cases which are made worse by psycho-analysis; probably they are not very common.

When the setting is changed for the better, when the constellation of ideas is looked on in a better light and acquires a new meaning, the symptoms disappear.

Freud has taught us the valuable lesson that we should not be too easily satisfied with the first or second complex that we find, but that we must be willing to go on looking. Where one may stop is a matter that experience will soon teach. The complexes should explain the case, and getting the patient to see them in another light should effect cure. The Freudians say that the latter process is unnecessary and that they do not do it, that the mere raising into consciousness is enough. It is not however easy to imagine two human beings shut up together day after day for months at a time, one of them strong and full of confidence, the other weak and without it, and believe that no word of advice or encouragement passes from one to the other.

Freudians talk a good deal about the intense resentment which their methods arouse in the patient, and they do so as if the disagreeable nature of a remedy were a point in favour of its foundation on truth; but many empirical remedies are disagreeable and even disgusting. As Cushny has pointed out, this is a relic of priestly practice which demanded expiation as necessary for recovery. With the introduction of elegant pharmacy the belief in drugs for their own sake has largely disappeared; highly disagreeable remedies depended largely on faith. The extreme resentment of the patient to being analysed is therefore a point in favour of the cure being a faith cure so far as it has any value.

This idea of faith is one that irritates the Freudians very much; they will have none of it. To the outsider the mere fact that the patient continues to come for months to see a doctor who often makes him angry is a sign of the faith that will move mountains: implicitly the patient has been promised that when everything has been revealed he will be cured. The analysts insist very strongly that they give no such promise, but it is childish to try to maintain that the promise is not there. They cannot really think that anything short of the expectation of cure would cause a patient to pay some hundreds of pounds while everything was being dragged into light, which he has spent his life in concealing. If an expectation of cure of this intensity is not the mark of a faith cure, the word has no meaning. They admit that after the sittings have gone on for some time an element of faith does come in. It will be found that the patient has numerous blockings while associating, and these frequently occur because of ideas coming up about the doctor—either those of faith in and affection for him, or the reverse, hatred and distrust. These feelings have been called positive and negative transference. While present the patient is dependent on the doctor—the "energy" of the complex is "transferred," gets an outlet in this way, and consequently the neurotic symptoms are frequently in abeyance.

This, they say, is the stage to which those of us who do not practise complete analysis get our patient. If they keep well, it is only because this positive transference remains active, and the patient, therefore, depends wholly on the doctor: obviously a precarious state, for the doctor may die or do something to lessen the affection and trust felt for him, and then the last state of the patient will be worse than the first. It is therefore necessary to teach the patient to depend on no man, and this is done by explaining the treacherous nature of transference and proceeding with the analysis.

It is doubtful, however, whether the faith in the doctor is ever got rid of in successful cases, and as pointed out above, the fact that the analysis continues to be made is proof that it persists. We are told that in the end the patient becomes quite indifferent to his doctor, does not thank him for his cure, never reports to him subsequently how he is—in short takes no sort of notice of him whatever. This is looked on as a sign of cure. It is rather laughable; there is something extremely innocent about these people. A patient who genuinely feels no gratitude towards someone who has helped to change his life from one of great

misery to one of happiness is not normal. But of course there is an obvious explanation to hand. If the smallest sign of gratitude is to be regarded as proof of the absence of cure, the wise patient will soon learn not to show any. However silly we thought it, most of us would humour our doctor to this extent.

To sum up, we may say that the method of psycho-analysis is unnecessarily tedious and severe, that there are shorter and pleasanter methods by which the end in view can be attained, and that if a complex is absolutely suppressed it had better remain so.

The attempt has been made in this paper to see the good in Freudian methods. We are greatly indebted to these researches in psychology, just as in physical medicine we are greatly indebted to the physiologists. But in the care of a cardiac case we do not repeat all the elaborate methods which the cardiologists have invented; we just use their results in so far as they have been found clinically helpful. When they say absurd things, and suggest that the presence of cardiac murmurs is of no importance, we pay no attention to that, knowing that men engaged in a research are apt to see but one side of a subject. So here, in so far as these doctrines are helpful, let us use them. They have shown that the ultimate cause of a neurosis often lies far back, that the memories of this cause are often concealed and distorted, that they are sometimes sexual, and that we need not despair of recovering what has been apparently forgotten. These things are of clinical value. The extravagances of the doctrines will pass away; unfortunately at present the subject of psycho-analysis is known chiefly through them; it is in the hope of making the true parts more prominent that this paper has been written.

NEW EDITIONS.

Immune Sera. By C. F. Bolduan and J. Koopman. Fifth Edition. Pp. viii + 206. New York: John Wiley & Sons, Inc. 1917. Price 7s. net.

This small book is what it claims to be, namely, "a concise exposition of our present knowledge of infection and immunity." In the ten years since it first appeared it has gone through five editions, and in this, its fifth edition, it has been thoroughly revised.

It deals briefly, but thoroughly, with all the main facts concerning immune sera which anyone but a specialist in the subject is likely to require.

A clear account is given of the work and views on immunity of Ehrlich, Bordet, Metchnikoff, Morgenroth, and others, with references to their published papers. In addition, it gives in detail some of the classical experiments which led these workers to formulate their various theories of antigen and antibody interaction.

The technique of the Wassermann test and the principles underlying are described, and the chapter on bacteriolysins and hæmolysins generally is perhaps the best in the book.

In brief, it can be thoroughly recommended to anyone in search of a short but reliable review of the all-important subject of immunity.

Diseases of the Eye. By J. Herbert Parsons. Third Edition. Pp. viii + 667. With 337 Illustrations. London: J. & A. Churchill. 1918.

All who are interested in diseases of the eye, whether students or practitioners, will welcome this new edition.

The chapters on anatomy, physiology, and optics contain an admirable exposition of what is required by the student without burdening him with unessentials. Stress is rightly laid on the importance of an understanding of optical principles as being the foundation of success in diagnosis and treatment.

Throughout, an outstanding feature is the masterly manner in which the practical aspect of the subject is treated, while the underlying scientific basis is always adequately dealt with. A considerable amount of new matter has been added, especially in regard to treatment and operations, and there is also a new, though short, section on symptomatic diseases of the eye. Three appendices contain much useful information on case-taking, therapeutics, and the visual requirements for the services.

The author's style is clear, and the explanations given of the more difficult subjects are always lucid and comprehensible. The print is good and easy to read, the illustrations are both plentiful and instructive, and the coloured plates reach a high standard of excellence. Misprints are absent, and the index is very full and accurate. No student of ophthalmology who requires a text-book could do better than choose this work.

Diseases of the Skin. By JAMES H. SEQUEIRA, M.D. Third Edition. Pp. 644. With 309 Illustrations. London: J. & A. Churchill. 1919. Price 36s. net.

THAT this book has so quickly reached a third edition is ample evidence of its popularity. It has been thoroughly revised and partly rewritten. By the inclusion of all the important advances made in dermatology during the war, the book has been brought entirely up to date. The illustrations are numerous and good and the text not too complicated. It is intended for students, and to them we can confidently recommend it. Whilst some of the diseases are not very fully treated, the busy practitioner will also find it useful. It is concise, and each disease is dealt with methodically. This new edition deserves even greater success than the previous ones.

Text-Book of Chemistry intended for the Use of Pharmaceutical and Medical Students. By S. P. SADTLER, V. COBLENTZ, and J. HOSTMANN. Fifth Edition. Pp. xiii + 765. With 143 Illustrations. Philadelphia and London: J. B. Lippincott Co. 1918. Price 21s. net.

OVER one hundred pages of this text-book are devoted to elementary physics—not physics of a type specially needed by the student in his chemical studies, but general physics, which might be more profitably studied in one of the many excellent elementary works on the subject. The dynamo, the telephone, and the eye as an optical instrument, not to mention the common pump and the general properties of sound, seem somewhat out of place in a text-book of chemistry.

In the sections on inorganic and on organic chemistry the authors have attempted to include too much, with the usual result that the book is neither readable on the one hand, nor a satisfactory work of reference on the other. In places it degenerates into mere lists of names and formulæ. Whilst the book is open to these general criticisms, it may still be recommended as a handy enough companion to the student of pharmacy or medicine. It is, on the whole, accurate, and moderately up to date in the systematic part. Exception must be

taken, however, to the mode of writing the constitutional formulæ of organic compounds. A dot in abbreviated organic formulæ should represent a "bond" in the full graphic formula. The authors only occasionally adopt this universally recognised convention. For example, the formula of thymol is erroneously written $C_6H_3.CH_3.OH.C_3H_7$, whereas that of eugenol is correctly given as $C_6H_3(OH)(OCH_3)C_3H_5$. If the necessity again arises to rewrite the book, it should be thoroughly rewritten and not patched, as is only too evident in the present edition.

A Junior Course of Practical Zoology. By A. Milnes Marshall and C. Herbert Hurst. Eighth Edition. Edited by F. W. Gamble, D.Sc., F.R.S. Pp. xxxvi + 515. With 94 Figures. London: John Murray. 1918. Price 12s. net.

Attention may be drawn to a few changes and suggestions which Professor Gamble has made in the new edition of this well-known and thoroughly sound practical text-book. He suggests that, where difficulty is experienced in obtaining *Amœba proteus* from pools, the smaller amœbæ from soil should be studied, and he adds directions for preparing a culture of soil amœbæ. An account of the reproductive cyst of *A. proteus* should have been given; the description in the text really relates to the cyst of another genus. An account is given of a trypanosome, the large species of trypanosome in the blood of the dogfish or the skate being suggested for examination. The kinetonuclear end is regarded as posterior, a view for which there seems to be little justification. A short chapter on a tapeworm has been added.

The statement on page 198 that the excretory tubules of amphioxus have been "recently discovered" is misleading, seeing that the discovery dates back to the early "nineties."

NOTES ON BOOKS.

Diseases of the Ear in School Children: an Essay on the Prevention of Deafness, by James Kerr Love, M.D., F.R.F.P.S.G. (John Wright & Sons, Ltd.), shows the prevalence of suppurative and non-suppurative disease of the ear in children of school age; the remarkable manner in which both varieties respond to treatment carried out under efficient supervision, and thereby causes a reduction in the amount of chronic suppuration and deafness in adult life. It will be read with benefit by every medical man.

A Manual of Diseases of the Nose, Throat, and Ear, by E. B. Gleason, M.D., University of Pennsylvania (4th edition, W. B. Saunders Co., price 14s. net), contains a great deal of information on the subject, not very well arranged, and giving rather an impression of hasty compilation. There is a good section on acute and chronic rhinitis, and some useful methods of treatment are indicated. The treatment of accessory sinus suppuration by suction is described and recommended. The description of the functional testing of the labyrinth is good, but the intracranial complications of middle-ear suppuration receive but slight attention. There is a useful collection of formulæ at the end of the book, and methods of using them are fully described and explained.

Eyes Right: Papers for Teachers and Parents on the Hygiene and Treatment of the Eye, by James M. Macphail, M.A., M.D. (2nd edition, Butterworth & Co., price one rupee), is meant to help teachers and others in India who have the care of children in the exercise of measures for the promotion of ocular hygiene. While the intention is in the highest degree laudable, the actual subject-matter and the mode of dealing with it might be considerably modified with advantage.

The Refraction of the Eye, by Gustavus Hartridge (J. & A. Churchill, price 7s. 6d. net). In the present edition (16th) the high standard set in this well-known work has been efficiently maintained. That useful instrument the ophthalmometer receives, however, rather less sympathetic treatment than it deserves. The aim of the book is thoroughly practical, and those who wish to study refraction will find in this manual an excellent and reliable guide.

Transactions of the College of Physicians of Philadelphia. This volume, vol. 39 of the third series, like its predecessors, contains a variety of articles that will appeal to all sections of the profession. The majority of the contributions are of general medical and surgical interest; but there are others on gynæcological, pharmacological, State and Army medical questions. In an appendix, forming one-third of the volume, are to be found discussions on ophthalmology, otology and laryngology, general and industrial medicine.

Two well-established favourites of the house surgeon and the senior student have recently appeared in fresh editions—*Pye's Surgical Handicraft* (John Wright & Sons, 21s. net), the eighth edition, edited by Mr. Clayton-Greene; and Sir Alfred Pearce Gould's *Elements of Surgical Diagnosis* (fifth edition) (Cassell & Co., 12s. 6d. net). Both have been thoroughly revised, and the most recent advances are incorporated in the text.

Nerve Injuries and their Treatment, by Sir James Purves Stewart and Mr. Arthur Evans (Henry Frowde and Hodder & Stoughton, 12s. 6d. net), soon established for itself a reputation as a reliable guide to surgeons called upon to deal with the nerve lesions met with in military work. The second edition now before us embodies the results of the very extensive experience of the authors, and we can cordially recommend it.

Shortly before his lamented death Professor A. Melville Paterson prepared a description of the *Anatomy of the Peripheral Nerves* (Henry Frowde and Hodder & Stoughton, 12s. 6d. net), for the use of students and surgeons, particularly those engaged in military orthopædic work. The subject-matter naturally does not differ from that contained in the standard works on anatomy, but the book is so arranged and printed as to render it convenient for ready reference, and the illustrations are well designed to meet the requirements of those for whom the work is intended.

The *Students' Aids Series* is, according to the advertisement, "specially designed to assist students in grouping and committing to memory the subjects on which they are to be examined." Those students who rely on this particular method of preparing for the ordeal of examination will probably find *Aids to Surgery* (Baillière, Tindall & Cox, 4s. 6d. net), compiled by Mr. Joseph Cunning and Mr. Cecil A. Joll, to their liking.

EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

Mind and Medicine.*

It may be doubted whether the majority of medical men of middle age, whose training dates from the eighties and nineties of last century, have learned to appreciate modern conceptions of the mental factor in disease. They were educated by teachers whose view of life was in general materialistic—if the term can be used without offence—teachers who, inspired by and having themselves played a part in the great biological advances of the mid-Victorian epoch, hoped to explain all symptoms, mental and other, on a mechanical or histological basis. And although the extreme doctrine that thought is a brain secretion had not many avowed supporters, the nature of mental processes, their influence on disease, and the significance of morbid mental states generally, were relegated to a subsidiary place in comparison with other signs of disease. With few exceptions the medical profession were *organicistes* to the backbone; in so far as hysteria, neurasthenia, and allied conditions were not due to exhaustion, to toxæmia, and to hereditarily ill-balanced nervous systems, they were caused by imagination or by lack of will-power. The doctrine that psychoses have a purely psychic cause is essentially a modern one, so far as the present generation of doctors is concerned.

Dr. Rivers has pointed out very clearly in what respect the modern conception of the mental factor in disease differs from the earlier vitalism, animism—call it what you will. The rôle that Freud assigns to the unconscious is one which enables the student "to adopt in the most complete manner the principle of determinism within the mental sphere which has been of such value in the progress of physical science." Without faith in the law of causation, the physicist comes to a standstill; yet so long as the student of mental disturbances confined his attention to the phenomena of the conscious, the doctrine of causation failed him, because he could not detect in consciousness

* *Mind and Medicine*, by W. H. R. Rivers, M.D., Longmans, Green & Co.

any orderly or constant series of antecedents. Freud, however, by demonstrating that unconscious mental processes were the antecedents of many of the phenomena of consciousness, placed the matter in a fresh light, in particular in the direction of applying the principle of determinism. For, according to the Freudian psychology, there is no such thing as an idea coming into the mind "by chance"; there is no such thing as a fortuitous recollection or a casual lapse of memory; a slip of the pen, a slip of the tongue, careless forgetfulness, do not occur by chance; they are determined by some emotional complex in the unconscious. It may well be said that others before Freud had dwelt on the mental factor in disease, but by this doctrine of psychical determinism he placed the subject on a sure foundation. It seems but fair to lay some stress on this point, because it is often more than hinted that the medical profession only began to study psychology after seeing the results of Christian Science, faith cures, and the like. This in reality is not so. No doubt the reaction from materialism and the growth of spiritualism and similar cults produced a favourable atmosphere, but the fact remains that it was a medical man who first placed psycho-pathology and therapeutics (perhaps it may also be said, psychology in general) on a scientific basis, and that when this was done he at once received a hearing. One of the greatest hindrances to the acceptance of the Freudian hypothesis has been its insistence on one particular group of emotions. The war, however, has indirectly assisted to remove this, by showing that other emotional complexes act in the same way as Freud believed the sexual group to operate. This has unquestionably been a great gain, and many to whom the writings of Freud and his school were repellent have been able to confirm the general truth of his observations and the value of his methods in neuroses due to the emotional stress of war.

From the principle of psychical determinism Dr. Rivers draws some important deductions as regards treatment. The symptoms, having a psychic cause, can be successfully treated only by a psychic remedy. Functional nervous and mental disorders depend on disturbance of the emotional aspects of the mind which are closely related to instinct. The delusions of the insane are rationalisations of an abnormal emotional state. Hence no good can be done by reasoning about them, since they have, to the patient, a logical basis.

In psycho-therapy, Dr. Rivers relies on three agencies: self-knowledge, self-reliance, and suggestion. When the morbid tendency lies in the unconscious, self-knowledge can only come through this being brought to consciousness — by psycho-analysis; there is, however, a very large group of cases where conscious experiences are being misinterpreted, and in these what is required is to talk them over with the patient and show him where the misunderstanding lies. This form of therapy was extensively practised and advocated by Déjerine. The

second agency, self-reliance, is cultivated, broadly, by inducing the patient to face up to his experiences, to discard adventitious means of cure, and to lead a natural social life despite his disability. Repression of war memories, for instance, is a common cause of their re-emergence from the unconscious in the distressing form of war dreams, with resulting insomnia, headaches, etc. Of suggestion, that which is most effective is unconscious suggestion; hence the success of the quack. The most powerful form of suggestion is hypnosis, which, however, is rarely required. It is tempting to follow Dr. Rivers in his analogy between the individual and the body politic. To understand social disorders, which depend on factors far back in the history of the people, historical research and sociological reasoning are required, which will reach these factors in the unconscious of the folk mind. Again, a nation must face facts, and not be content to swallow placebos. The suggestion of its leaders may lead a nation either to panic or to greatness, and is a potent instrument for good or evil in the life of the social organism.

The importance which modern psychological research gives to the emotions can hardly be overrated. To say that man is a reasoning animal is but a half-truth. Reason is assuredly a less potent factor in human affairs than is tacitly assumed. The fact seems to be that only a very small part of our beliefs and actions are based on reason, and this is not wonderful, seeing that on the one hand character and personality are probably formed, in their main outlines at least, in early childhood, and on the other, that the average man's actual first-hand knowledge of facts is, relatively, almost incredibly small. It might almost be argued that we only think and act rationally in matters concerning which we have received particular training, and that on matters outside that sphere we act, and form convictions, instinctively. The greatest of modern French writers, in a spirit of philosophic anarchism, derides official government and systematic philanthropy for their stupidity, and scorns abstract legal justice and scientific history as impossible. It is implicit in his philosophy that the sociological facts on which a reasoned course of action in these spheres could be founded are unknown, and from their complexity must remain so; that the feelings of the ordinary man are a better guide—the herd instinct, the popular belief and custom. The success of democracy as a system of government depends less on its harmony with any inherent right of man than on its decisions, based mainly on instinct and emotion, sufficiently satisfying man's requirements at his present stage of progress.

OBSERVATIONS ON WOUND TREATMENT BY MEANS OF EUSOL.

With Special Reference to the Methods of Continuous Irrigation and Lavage.

By JAMES B. HOGARTH,
M.B., Ch.B.(Edin.), Captain, R.A.M.C.(T.).

In medicine, as in other branches of science, the war has acted as a stimulus to research and invention, and in no department of medicine has this been more productive than in the treatment of septic wounds and processes. For a considerable number of years before the war this subject seems to have attracted little serious consideration. The improvements in methods of securing asepsis have been, to a large extent, accountable for this apparent neglect, inasmuch as surgeons were able to perform extensive operations with little fear of the wounds becoming septic. The necessity, however, of preventing sepsis on the field, and afterwards of combating it in hospital, has produced a wealth of suggestion regarding methods to be adopted in preventing, overcoming, or modifying septic infection of wounds.

In view of the failure of iodine as a field antiseptic, and as a result of the inadequacy of carbolic acid, both as a lotion and as an ointment, to counteract septic processes in wounds, it became a matter of the utmost necessity to discover an agent which would efficiently prevent or control wound infection.

As a result of a request by the Medical Research Committee that a special investigation with this aim should be made in the medical schools, Professor Lorrain Smith and his colleagues in the Pathological Department of the University of Edinburgh concentrated their efforts towards the discovery of such an agent.

The result of their investigations was to draw attention to the potency of chlorine and its derivatives, and in a communication made in July 1915, entitled "Experimental Observations on the Antiseptic Action of Hypochlorous Acid and its Application to Wound Treatment," they announced that they had found an antiseptic which was likely to prove effective. Their experimental work proved that hypochlorous acid was not only a powerful antiseptic, but that it possessed the great additional advantage of being non-injurious to the tissues.

Already the wide use accorded both in civil and military

practice at home and abroad to the solution of hypochlorous acid known as eusol, says much for its success in fulfilling requirements.

In the summer of 1915, while acting as resident surgeon to Mr. Miles in the Edinburgh Royal Infirmary, I had many opportunities of using and seeing it used, and was much impressed by the successful results obtained both in civil and military cases. The experimental work which was carried out in connection with its discovery had proved that it was a powerful antiseptic, and it now became desirable to find out the best methods of using the solution.

Both in Edinburgh, while House Surgeon in the Royal Infirmary, and afterwards whilst holding a similar appointment in the Derbyshire Royal Infirmary under Mr. Southern and Mr. Hicks, I was afforded every facility for trying different methods and forming an estimate of their relative merits in wound treatment. At first I used the solution cold, but with further experience found that better results were obtained when it was used in a warm state. This is quite a rational conclusion, as it is invariably the case that chemical reaction takes place more quickly and completely in the presence of heat. Hence we may well suppose that the germicidal power of eusol will be increased when it is used warm.

The following are the various methods which I have employed in treating septic wounds with eusol: (1) as a simple lotion, or in conjunction with 10 per cent. saline; (2) as a gauze compress; (3) as a fomentation; (4) as a bath; (5) by means of an apparatus for securing continuous irrigation; (6) by means of an apparatus for securing continuous lavage and drainage; (7) by means of gauze plugs used alternately with a solution of potassium iodide of a strength of 40 per cent.

(1) *As a Simple Lotion, or Diluted with an Equal Quantity of* 10 *per cent. Saline.*—The wounds treated by the above means were chiefly those of a more or less superficial character in which suppuration did not tend to become excessive, and in which it was unnecessary to resort to more prolonged application. These wounds were simply bathed with the warm lotion, perforated oiled silk protective being placed round the edges, and sterile gauze then applied. In all the cases treated in this way the process of wound granulation was perfectly satisfactory: the wounds possessed all the characteristics of healthy healing sores, their surfaces did not bleed too readily, nor was there

any tendency for the granulations to become superabundant or œdematous. In three cases, where the raw surface was very extensive, skin-grafting was resorted to and the grafts adhered and grew readily. As regards its effect on epithelial growth, I have not observed that there is either retardation or stimulation.

(2) *As a Gauze Dressing without Waterproof.*—This method has been chiefly adopted after the septic process has been brought under control by means of fomentations, and is excellent as a means of keeping it in check. After a time the dressings are apt to become dry, but the application of the antiseptic is of sufficiently long duration to keep the wound clean. Moreover, as the granulations are apt to become rather œdematous after continued fomenting, evaporation of moisture from the wound is by this means facilitated, and the above-mentioned condition favourably influenced.

(3) *As a Fomentation.*—I have been in the habit of treating all foul, freely suppurating wounds with wet eusol dressings, and have in several instances resorted to this treatment in extensive wounds which have resulted from accidents. The object of treating the latter in this manner was to prevent the occurrence of sepsis, and in every case I found it to be efficacious. In the former cases where sepsis was present in a marked degree, and the patient's chart showed a swinging temperature, I have frequently noted a rapid and permanent subsidence of feverish symptoms, both as indicated by the chart and the general condition of the patient. In no case had the patient been taking any fever-reducing medicine. In cases also where the suppurative process was associated with fœtor, the latter was rapidly eliminated. It is interesting to note that while the wound discharge undergoes approximately the usual alterations in character, the process takes place by more rapid stages. At first of a creamy consistency, the pus in a few days becomes thinner, clearer, and more scanty—indeed, more like lymph. Thereafter it again alters its character and becomes serosanguineous. This may be explained on the ground that after continued treatment with eusol the granulations assume a deeper red colour than usual. It is probable that this is due to the penetrative property of the antiseptic and its effect in reducing hæmoglobin. Its action in altering hæmoglobin can readily be observed when a bleeding wound is being cleansed with the solution, the blood quickly assuming a greenish coloration. As

soon as the discharge becomes like blood-tinged serum, fomentations are discontinued and wet gauze dressings employed.

When sloughs are present in the wound, their separation takes place more quickly under the influence of eusol fomentations than they do when similarly treated by boracic acid.

When the fomentations were first applied the patients occasionally complained of a smarting sensation, but this was of short duration. The amount of skin irritation produced by the continuous application of eusol fomentations, even for several days, is almost negligible, though there may be some tendency towards œdema of the granulations:—

The power of the antiseptic in preventing the occurrence of sepsis is well illustrated by the following case which I treated with eusol fomentations.

The patient, a man of sixty years of age, was admitted to hospital on 2nd March 1916, suffering from a compound fracture of the olecranon process of the ulna, involving the left elbow-joint, as a result of falling on the tip of the elbow. The wound had bled freely previous to his admission. On examination, the wound was found to communicate with the elbow-joint, and the olecranon process was comminuted.

The patient was at once anæsthetised, the comminuted pieces of the olecranon and small portions of tissues likely to slough were removed, the joint cavity syringed thoroughly with warm eusol and packed lightly with gauze soaked in the solution. The arm was then put up on a right-angled splint.

Dressing was carried out daily in the above manner. The wound never showed any sign of sepsis. The four-hourly chart indicated slight rises of temperature above normal for three days subsequent to his admission, and thereafter, until the date of his discharge on 30th March 1916, remained consistently below normal. On the twentieth day, the wound communication with the elbow-joint being closed and the granulations on the base of the wound and on the skin flap being abundant and healthy in appearance, the skin flap was then sutured to the wound edges and complete healing took place.

Three weeks after his discharge from hospital I saw the patient in the out-patient department, and at that time he had a normal range of movement unaccompanied by any pain.

As illustrative of its power to overcome septic infection of a very virulent type, I may cite the case of a female patient who was admitted to hospital suffering from a rapidly spreading

phagedenic ulceration of the right breast. The patient, who had been nursing a child, gave me to understand that a week previously a papule had developed just below the nipple and within the areolar area. It was very painful, and later, becoming pustular, it burst. The process of ulceration then spread rapidly, so that on admission the whole of the right breast was involved. When admitted she was highly fevered, the temperature being 103·4° F. Eusol fomentations were applied every four hours at first, and from the commencement of the treatment the ulcerative process was checked: within a week the temperature fell to normal, and the raw area showed healthy and active granulations. Epithelial ingrowth was also manifested. The extensive raw area was then skin-grafted with satisfactory results.

(4) *As a Bath.*—When treating wounds with a eusol bath I have always used the solution at full strength, the temperature being about 110° F. The patient is treated in this manner once, and sometimes twice, a day, according to requirements, the duration of the bath being about an hour or two hours. When a solution of the above temperature is used, no renewal of the solution is necessary during the exposure. Wounds of the hand, forearm, or foot are specially suitable for this mode of treatment.

(5) *By means of an Apparatus for Securing Continuous Irrigation.*—The method of applying continuous irrigation, as about to be described, was first used in the Edinburgh Royal Infirmary in the summer of 1915, by means of an apparatus which I devised for this purpose, while acting as resident surgeon to Mr. Miles. It is quite simple in its construction and method of working, and in its general applicability can be used in practically all kinds of septic wounds, though for preference I think that it is best adapted for large open wounds of some depth. The method ensures a continuous flow of the fresh warm antiseptic into the wound and, by diluting the wound discharge, aims at securing at the same time more complete drainage.

The following is a short description of the apparatus (Fig. 1), together with a few notes on its method of preparation and mode of working; and accompanying is a diagram from which it will be seen that its action consists in a simple application of the principle of capillary attraction. The articles enumerated below are necessary for its construction:—

(1) A glass bottle with a wide neck, and with a capacity of about 6 oz.; (2) a tightly fitting cork; (3) a piece of V-shaped glass tubing with a calibre of about $\frac{3}{8}$ in.; (4) 3 feet of rubber

tubing with a calibre of about $\frac{1}{4}$ in.; (5) a ball of spirit-lamp wick, the fibre of which should not be too fine, as otherwise it will be more readily destroyed by the eusol solution; (6) a short length of thin iron wire; (7) a silver probe with an eye; (8) a set of cork borers; (9) a glass spool.

A hole of suitable size to admit the V tube is first bored in the cork, and another which remains open in order to secure equalisation of air pressure. A piece of glass tubing with a calibre of about $\frac{3}{8}$ in. is then bent into the form of V and the ends rounded in the flame, the latter process being performed to prevent cutting or fraying of the rubber tube. Having inserted the V tube in the

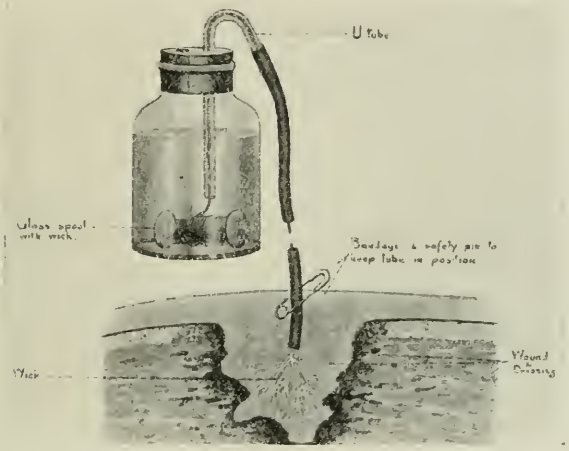

FIG. 1.

cork, we take the glass spool and, winding round it a sufficient quantity of spirit-lamp wick as a reserve, we leave free a length of about four feet. Now take the iron wire, pass it downwards through the V tube, fasten it to the free end of the wick, and draw it through. Detach the wire, thread the eye of the probe with the wick, and it is now an easy matter to pass the wick through the whole extent of the rubber tubing. Lastly, fit the rubber tubing over the end of the V tube, fill the bottle with eusol, place the spool in the bottle, and the apparatus is ready for use.

Method of Use.—I have used the apparatus as above described in a great variety of septic wounds, both in military and civil practice, and the results have been most encouraging. Among the cases so treated may be mentioned ordinary flesh wounds, cases of acute appendicitis with abscess, and compound fractures,

and almost without exception they did better under this form of treatment than by ordinary dressings with eusol; and, indeed, before having recourse to continuous irrigation, some of them had previously been treated with eusol fomentations. If the best results are to be obtained, there are certain points in connection with the use of the apparatus that should receive attention. The first is that the solution should be kept warm. This can easily be secured by placing the bottle in a bowl of water at a temperature of about 120° F. This is good enough for all practical purposes, as it does not necessitate that the water in the bowl should be frequently changed. In order to secure a uniform temperature of the solution in the reservoir, I have recently made use of a Thermos flask, and find that it answers the purpose admirably. The second point is that the reservoir should be situated at such a height above the wound to be treated that the drop-rate from the wick should not exceed about 10 drops per minute: otherwise the dressings will become unnecessarily wet, which it is desirable to avoid, both from the point of view of comfort to the patient and extra labour to the nursing staff. Further, the wick should be placed well over the surface of the wound, or, in the case of a deep wound, towards the bottom of it. When treating a deep wound by this means it is advisable that a gauze dressing should be packed lightly into it, as in this way much better drainage is obtained. Pressure on the tube and any tendency to its withdrawal from the wound may be prevented by the use of a cage. I have found it most convenient, especially in treating appendicular wounds and those of the lower extremity, to suspend the reservoir from the top of the cage. If this be done, there will then be no need to keep the solution warm, as it must always approximate closely to body heat before it reaches the wound surfaces. The many-tailed bandage loosely applied is useful in keeping the tube in the wound or amongst the dressings. After the apparatus has been in action for some time, and especially if the wound under treatment is very septic, it may be noticed that the solution is not flowing satisfactorily. This will almost invariably be found to result from saturation of the wick in the wound and in the lower end of the tube with pus, and consequent interference with capillary action. When the irrigation is thus interfered with, it is a simple matter to remove the tube from the wound, pull down the wick, and cut off the part which has become blocked.

After having carried out this treatment continuously for three

or four days I have occasionally noticed an erythematous condition of the skin in the region of the wound, which in its features much resembles a scarlatinal rash, but have never observed it to be accompanied by any constitutional disturbance, nor did it ever extend. The reddened area was not sharply demarcated, nor had the rash the fiery red appearance of an erysipelas, and it is probable that it was due to irritation produced by the eusol solution. When any tendency to this condition is noticed round the wound edges its further spread may be cut short by the application of sterile vaseline to the skin in the region of the wound. In no instance have I observed a severe degree of skin irritation except in the case of an old man suffering from an extensive cellulitis of the left thigh, and this would not have occurred had proper prophylactic measures been adopted. In his case the symptoms of irritation rapidly subsided on the discontinuance of the treatment for a few days. In several instances of appendicular abscess treated in the above manner it has become apparent that the bacillus coli infection, which so often produces a copious flow of pus about the fifth, sixth, and seventh days, has been considerably modified. I have used eusol alone in its full strength in nearly all cases treated by this method, as it was found that, when used along with 10 per cent. saline, the discharge became, not exactly viscous, but rather of a mucoid consistency, so that free drainage was not obtained. When continuous irrigation is adopted in the treatment of foully smelling suppurating wounds, it will be found that fœtor is rapidly eliminated.

Alternative Form of Apparatus.—Following a suggestion made by Mr. Cathcart that a modification of the above-described apparatus involving the application of the principle of the syphon might be used, I constructed a modified syphon, as described below.

We have, as before, a wide-necked bottle, fitted with a double-channelled cork, glass V tubing, all similar to those before described, except that the V tube reaches to the bottom of the reservoir. A glass nozzle is fitted to the end of the rubber tube, a fountain-pen filler doing admirably for this purpose: above the attachment a screw clamp is fixed to control the rate of flow, and a short length of rubber tubing for insertion in the wound is attached to the end of the nozzle. The syphon action may be conveniently started by exhausting the bulb of a Klapp's suction bell and attaching its rubber tube to the end of the glass nozzle, from which a fine stream then issues. The desirable drop-rate

can be obtained by tightening the screw clamp. The rubber ending for insertion in the wound is then attached, and the apparatus is ready for use.

By releasing the screw clamp a wound can be readily flushed out, and, if it be desired, the glass nozzle provides a useful spray while performing a dressing.

I have not found this modification so simple in its application, nor so efficient in its mode of action, as the capillary apparatus.

It may be of interest to state that the two forms of apparatus above described were used in the Royal Infirmary in Edinburgh before the Carrel apparatus was introduced. The above forms of apparatus have an advantage in that they can be improvised from materials which are readily obtainable.

(6) *By means of an Apparatus for Securing Continuous Lavage and Drainage, etc.*—Having obtained some measure of success in treating wounds with eusol by means of continuous irrigation, I was led to think that it might be possible still further to extend the method, at the same time attempting to include certain other fundamental principles of wound treatment, and I submit the following as a practical method of application. Glass and rubber manufacturers being extremely busy owing to war exigencies, I was obliged for a time to use the instrument in a roughly improvised form, but latterly was able to obtain a form made of blown glass, which was manufactured for me by Messrs. J. Preston & Sons, Scientific Instrument Manufacturers, of Sheffield. For an extensive series of experiments a variety of different shapes is desirable, and the instrument should be made in moulds, and the material either of glass or rubber, or both combined.

Description of the Apparatus.—The accompanying diagram (Fig. 2) illustrates the construction and mode of action of the instrument. It consists of an outer and inner chamber. The outer chamber serves as a means of fixing the instrument in position over the wound, this being accomplished by means of air suction, a glass tube being inserted in the outer wall for that purpose. The inner chamber, through which the eusol solution is intended to circulate, is provided with inlet and exit openings. The inlet glass tube perforates the roof of the inner chamber and extends throughout half its depth. The exit opening is also in the roof of the inner chamber and is situated at the top of it. The supply of eusol is obtained from a reservoir which is connected with the inlet by means of a length of rubber tubing of suitable calibre, the rate of flow of the solution from the reservoir being regulated by

means of a screw clamp affixed to the tubing. A suitable length of rubber tubing is also connected with the inlet tube inside the lavage chamber to ensure that the solution passes down to the bottom of the wound. A length of rubber tubing is attached to the exit, its free end being fitted with an S-shaped piece of glass tubing, the purpose of this being to prevent any backward suction of air when the apparatus is being applied.

Advantages of the Method.—Realising that in eusol we are dealing with a powerful, non-injurious, and non-toxic antiseptic, our aim is to use it as freely as possible and in accordance with

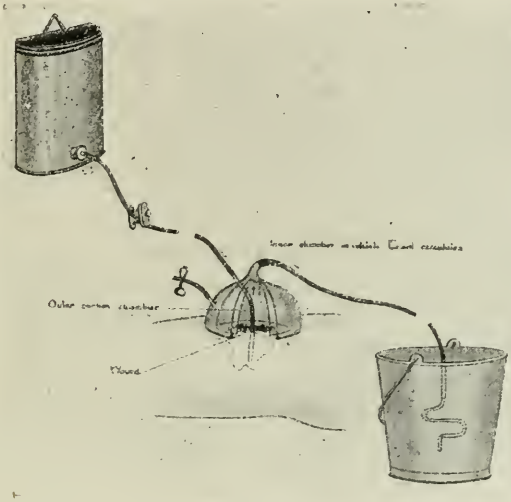

FIG. 2.

Diameter of outer chamber . . .	3½ inches.
Diameter of inner chamber . . .	2½ inches.
Height of inner chamber . . .	2½ inches.

such other principles of wound treatment as will ensure the utmost benefit being derived from its application. In the treatment of septic wounds by this means all the chief principles of wound treatment are observed, namely:—

Mechanical Cleansing of the Wound Surfaces.—In most forms of wound treatment mechanical cleansing is only possible at such times as a dressing is being performed, and though there may be a fair amount of drainage, it is at the best imperfect, with the result that the wound surfaces and dressings are continually bathed in pus. By using this apparatus we are enabled to secure during the period of its application all the advantages of a continuous lavage.

Antiseptic Action of the Solution.—This, in view of the other principles involved, I believe to be of special importance in this method of wound treatment, as, on account of the mechanical cleansing of the wound surfaces and the continuous removal of pus, the fresh warm solution obtains better access to the crypts which harbour bacteria.

Drainage.—As this is very efficiently performed by means of the apparatus, we get rid of large numbers of bacteria and their toxic products, and so prevent the danger incurred through the absorption of the latter.

Lymph Lavage.—Eusol, having the properties of a saline solution, is capable of producing this phenomenon, but I believe that by combining it with an equal quantity of 10 per cent. saline a greater flow of lymph is produced from the wound surfaces. Moreover, it is highly probable that, in view of the degree of hyperæmia produced by the application of the instrument and maintained while it is in use, the lymph flow may be still further increased.

Hyperæmia of the Wound Edges.—When the instrument is applied a considerable degree of hyperæmia is produced, which is not merely restricted to the area of the skin subjected to suction but is very well exhibited by the skin surface in the lavage chamber, *i.e.* in the immediate vicinity of the wound. Hence in the application of this method of continuous lavage we should, in addition, secure the advantages consequent on the presence of hyperæmia, *e.g.* greater phagocytic infiltration and, in all probability, increased exudation from the wound surfaces.

Exclusion of Air.—Certain pyogenic organisms being by choice aerobes, it is reasonable to suppose that, deprived of their oxygen supply, their multiplication, virulence, and resistance to the power of the antiseptic should be diminished.

Method of Use.—It has been my practice to use equal parts of eusol and 10 per cent. saline solution, the latter being added with the object of increasing the flow of lymph from the wound surfaces. The temperature of the solution was about 110° F., and the period of application did not exceed three hours. A douche-can forms a suitable reservoir, and the warmth of the solution is maintained by the addition to it from time to time of fresh warm solution.

Sterile vaseline having been applied to the skin surface in the vicinity of the wound, and the inlet rubber tube having been inserted in the wound, the instrument is fixed in position by

means of the pump of a Potain's aspirator, the requisite degree of suction being maintained by means of a spring clip controlling the rubber tube attached to the glass tube connection of the outer chamber. Having fixed the instrument in position, we now attach the rubber tube leading from the reservoir to the inlet, and, similarly, attach the drainage tube leading from the exit to a pail by the side of the bed. The solution may now be permitted to flow from the reservoir which is in position at some height above the bed, when the inner chamber is quickly filled, and as soon as the return fluid becomes quite clear the flow can be diminished by tightening the screw clamp. This should be so regulated that the return fluid should not exceed a rapid drop rate. If it be thought desirable to flush out the wound at intervals during the application, this may be done simply by releasing the screw clamp. The apparatus should have the protection of a cage to provide against the possibility of detachment by the pull of the bedclothes.

I have used this instrument only as a means of lavage and drainage, but it is clear that it is well suited for supplying an antiseptic in the form of a gas; and having this in view, I think that an ideal method of treating septic wounds would be by a preliminary lavage and afterwards by treating with hypochlorous acid gas. A lavage might be carried out for about an hour and, the instrument being removed and reapplied, the gas supplied from a generating chamber could be led into the wound and its presence assured in sufficient density by closing the exit opening. As Professor Lorrain Smith and his colleagues have stated that hypochlorous acid as a gas is a more efficient antiseptic than it is in solution, it may be well that, under some additional pressure, its penetrability and consequent antiseptic action will be increased, and that by a few applications of this form of treatment all organisms and their spores might be destroyed.

With regard to the form of the instrument, it might prove of advantage to have the outer and inner chambers made separate. The inner chamber could readily be made to fit tightly into the outer chamber. The pressure on the skin would then be only exerted by the rubber rims of the outer chamber, and would prove more adaptable, more comfortable, and less likely to become detached.

(7) *Alternate Use of Eusol and Potassium Iodide Plugs.*—This is a method which I have adopted in the treatment of persistent

sinuses, the rationale of the treatment being that irritation in a mild degree would be set up by the deposition of free iodine on the walls of the sinus, and the process of granulation so stimulated. By this means, in addition to the antiseptic action exercised by the eusol, we secure the antiseptic action of the iodine as well. It is probable that the nascent iodine is not merely deposited along the walls of the sinus, but is also to some extent deposited in the tissues in the immediate vicinity of the lining membrane of the sinus.

When treating cases in this way I have used eusol in full strength and potassium iodide in a 40 per cent. solution, and thin strips of rolled gauze for purposes of application. It has been my practice to use in the morning a plug soaked in potassium iodide, and in the evening to employ eusol in a similar fashion. Patients usually complain of a smarting sensation on the application of the potassium iodide solution, but this is not in any way excessive nor of long duration.

Cases Treated.

I have treated in this way persistent sinuses and a tuberculous ischio-rectal abscess.

One case was that of a soldier in whom a sinus in the groin following a shrapnel wound had persisted for a period of two months without any sign of healing. There was a fair degree of discharge, a film of which showed the presence of streptococci and staphylococci. The length of the sinus was about three inches, and was in close proximity to the large vessels, the line of which it took upwards under Poupart's ligament. The result was that the sinus was completely healed in fourteen days from the commencement of the treatment.

Another case was also that of a soldier. He had received a bullet wound in the left lumbar region of the abdomen. An operation for the removal of the bullet had been performed in France. A sinus persisted in the wound. The infection was of the bacillus coli type. This was similarly treated, and was completely healed in ten days. The sinus had shown no perceptible sign of improvement during a month's treatment in the Infirmary until this treatment was adopted.

A third case was that of a civilian who had been in hospital for over six months suffering from an ischio-rectal abscess. The condition was evidently tuberculous, and the discharge was pro-

fuse and offensive, due to the presence of the bacillus coli. The sinus had been opened and scraped on three occasions, but showed little, if any, tendency to heal. I opened and scraped the sinus, and commenced the potassium iodide and eusol treatment. In less than six weeks the sinus was practically healed and the patient was discharged, having been instructed to come to the out-patient department and report. When I saw him a fortnight later the condition was most satisfactory. The sinus was then about one half-inch in length, and the discharge negligible. As he was told to come again if he had further trouble and did not reappear, it is to be presumed that healing was complete.

I am indebted to Dr. George Buchanan for the diagrams.

HYSTERICAL COMPLICATIONS OF "RHEUMATISM."

By R. G. GORDON, M.D., B.Sc., M.R.C.P.(Edin.),
late Captain, R.A.M.C.

It will be generally agreed that the term rheumatism is used much too loosely both by the laity and the medical profession. Any ache or pain, whether in the muscles, bones, or joints, is referred to as rheumatic, and any stiffening or deformity associated with or following after such pains is described as the result of rheumatism.

In the army an attempt has been made to confine the term rheumatism to its proper use, which is to describe an acute febrile condition, accompanied by articular pain and swelling, more accurately called acute rheumatism or rheumatic fever. The vague term "rheumatism," which is used in civil practice, is replaced in army practice by the term "myalgia." Thousands of soldiers have been invalided to England and subsequently discharged with this diagnosis. Amongst these no doubt there are a certain number suffering from chronic articular conditions, such as rheumatoid arthritis, osteo-arthritis, villous and gonococcal arthritis, but the vast majority of them should be diagnosed as cases of fibrositis, a condition which may be manifested in the muscles, joints, or peri-articular structures.

Fibrositis can always be diagnosed with certainty by the presence of nodules. Stockman, Maxwell Telling, and Llewellyn have pointed out their importance, and have shown how they can be detected quite easily by the careful palpation of muscles and fascia, in which they can actually be felt if the parts are properly relaxed. Pressure upon these nodules may produce radiating pains in the rest of the muscle, and in the early stages of the disability it is often easier to detect them as tender points than as palpable differences of structure.

Where nodules are not present, and where the other more serious joint conditions can be excluded, we must presume there is no active disease. In the very numerous cases in which this is the state of affairs, the patient will still complain of pain and stiffness and may be much crippled, assuming abnormal postures and gaits. It is not of course suggested that there never has been any attack of arthritis or fibrositis, but in the majority of cases a mild attack passes off in the course of a few weeks.

Many of these soldiers have continued in the same state of disability for many months. What has happened is that a position of ease was adopted for the muscles when the pain due to the acute condition was present. This has resulted in abnormal postures, which have been maintained subconsciously after the inflammatory condition has passed off.

The acceptance of Babinski's definition of hysteria—"a condition in which symptoms are present which have been produced by suggestion"—enables us to bring under this heading a large number of conditions which otherwise would be unclassified. There can be no stronger suggestion than the presence of actual disease in the individual's own person. Small wonder then that transient disease is often perpetuated by suggestion, so becoming a true hysterical manifestation. The recognition of this occurrence is, however, of paramount importance from the point of view of treatment. Such postures then are true hysterical symptoms, for they are produced and maintained by the suggestion prompted by the actual disease. In this state the pain which is present is no longer due to inflammation, but to the cramp produced by the muscles which are being held in a state of abnormal tone, and to the stretching of fibrous tissues and of other muscles, as well as to the pressure which is being kept up on abnormal surfaces in the joints. The successful treatment of these cases is at once followed by the absolute disappearance of the pain when the normal posture and gait are restored.

Although the result of suggestion in the cases under discussion is as a rule fairly constant, namely the immobilisation of a limb or of the trunk by involuntary muscular rigidity, it is as well to distinguish clearly two forms of suggestive influences. In the first group the patient will give a history of muscular pain, which he will refer to as muscular rheumatism, myalgia, lumbago, neuritis, or sciatica, according to the location of the discomfort. To this group should be added the numerous cases in which the patients complain of persistent pain and stiffness after trench fever. The pain in the latter condition is presumably due to a toxic fibrositis, so that it may be legitimately included in the present paper. In such cases the rigidity generally affects the whole limb rather than one definite joint. In the second group the history will be of a definite inflammation of a joint. If the original infection was mono-articular, the patient will hold that particular joint stiff while the others may be freely movable. Sir James Paget, in his lecture on "Conditions that Bone-Setters may Cure," which was

published in 1857, drew attention to these conditions, in which a joint is held stiff by involuntary muscular contractions. Again, in his lectures on "Nervous Mimicry," he points out how often acute joint conditions are simulated in cases in which joints are either quite normal or the subject of trivial lesions, quite incompatible with the pain and abnormal posture observed. He also remarks how joints may be apparently distorted and deformed by abnormal action of the muscles involved, so that they appear as if they were the seat of gross organic changes. Too little attention has been paid to this condition since Paget first described it, but it is so common and its successful treatment brings so much kudos to unorthodox practitioners that it merits most careful attention from medical men.

Treatment.—Having satisfied one's self that the condition is truly hysterical, the treatment to be adopted is the same as for other hysterical conditions, viz. persuasion and re-education. The true nature of the condition is first explained to the patient, his confidence and co-operation are invited, the extent to which these important factors are obtained depending upon the personality and persuasive powers of the physician. In their absence treatment will be difficult, and in order to get them the physician must impress upon the patient that he is really taking an interest in him, and that his sole object is to cure him. Next the patient is shown how he is keeping certain muscles tight, and how on attempting any movement they pass into a condition of spasm. He is then placed upon a bed and told to relax his whole body completely, specially directing his mind to the relaxation of the muscles involved. Passive movement is now carried out, and without any violence the muscles are loosened and the limb can be brought into a normal position. The question of how much pain the patient is called upon to suffer is very important. It would seem that a certain amount of pain must often be experienced in the process of relaxation of muscular spasm, but this in uncomplicated cases should never be of a severe nature. Always taking into account the reaction of the patient towards pain and the violence of his emotional expression, pain which is obviously severe means either that adhesions are present, which require breaking down, or that a joint condition is being dealt with which is more serious than had appeared at first sight.

If much pain is experienced, other methods of diagnosis must be employed, and a good skiagram and possibly an examination under an anæsthetic will be helpful. In cases where the lower

limb is involved, spinal anæsthesia is often extremely useful, for under the relaxation thereby induced the amount of limitation of movement due to purely muscular spasm can be determined, and the patient, being conscious all the time, can see for himself to what extent his limb is freely movable and is encouraged to carry out voluntary movements as his power returns.

When the limb has been brought into a normal position, the patient must at once be made to use it, and should not be left until he has attained a high degree of perfection in moving it in every possible direction. This concentration of the cure into one sitting is the crux of the whole problem, for unless the patient is brought along sufficiently far to see for himself that he is really going to be cured, he is very likely to relapse into his old state before the treatment is begun the next day. This is what makes massage treatment so disappointing, even though it is intelligently carried out and accompanied by encouragement of the patient to make voluntary movement. A slight degree of progress is achieved, but the treatment is not sufficiently prolonged to stabilise this, and by the time it is again undertaken the whole process has to be gone through afresh. On the other hand, completion of the cure by psychotherapy, though often accomplished in a few minutes, sometimes requires a sitting of one or two or even many hours, but once the requisite degree of voluntary movement is obtained, it is stabilised by the fact that the patient sees he really can move and he is only too eager to progress. Many doctors complain that they cannot spare the time for such a long sitting with one patient. This, however, is a fallacious argument, for the amount of time which they eventually spend over the patient, perhaps in the end without obtaining a cure, will amount to many times the duration required to obtain a successful result in a single sitting.

Having taught the patient to make all normal movements with his limb, it is generally necessary to re-educate him still further in order to employ these movements for particular purposes; otherwise he is apt to keep the limb immobilised in spite of the fact that movements are not only possible but painless. For this purpose congenial occupation is undoubtedly best, and he should be put to some work in which his interest is aroused, so that he uses his limb automatically, and in a very short time he will regain the full utility which he enjoyed before his attack of rheumatism.

By the courtesy of Dr. Llewellyn and the physicians of the Bath Mineral Water Hospital, I was allowed to see and treat

certain cases, who were suffering from the condition described above. In addition, several post-rheumatic cases were admitted to Seale Hayne Military Hospital, both from Bath and elsewhere. A short description of some of these will illustrate my meaning better than further words.

1. *Cases following Fibrositis.*—The bent back of soldiers is a familiar sequel of rheumatism, and therefore scarcely needs to be mentioned here. It has been said that cures of such cases can only be effected easily in special hospitals, with a special atmosphere, or when the patient is well acquainted with, or has peculiar confidence in his physician. That this is not necessary is shown by the following cases :—

Sergt. S. was seen for the first time at the Bath Mineral Water Hospital at 10 A.M. He was walking with two sticks, his back being completely bent, a condition which had persisted some eight months. On lying down he was not able to get quite flat, his knees being raised if his shoulders rested on the bed. In a very short time he was persuaded to relax his muscles so that his legs could be straightened out. It was then pointed out to him that the attitude which he now adopted in the recumbent position was quite possible in the erect posture. On getting up he was persuaded to stand straight but walked with great difficulty, his hips being kept quite stiff. Re-education was proceeded with, and an hour and a quarter after starting treatment he was able to run. He did not relapse and was able to get about normally.

Pte. B. was also seen at Bath Mineral Water Hospital. As a result of rheumatism in October 1917 he had developed an abnormal posture, in which he was very much bent to the right, with stiffness of the right hip and knee. He could with difficulty get about with a stick. After one hour and twenty minutes' treatment on 21st November 1918, he was able to hold himself straight and walk and run to a certain extent, although his gait was by no means normal. Owing to pressure of time it was impossible to continue the treatment then, but on admission to Seale Hayne Hospital a fortnight later he was found to be practically well, and in a very short time learnt to run and walk perfectly normally.

The following were some typical cases treated at Seale Hayne Hospital :—

Pte. S. had had attacks of muscular pain occurring at intervals since childhood, his last attack being in July 1918. He was admitted in December 1918, with combined scoliosis and kyphosis, with stiffness

of both legs, which had lasted two years and five months. After an hour's treatment, he was persuaded to relax completely and stand and move normally. In both these last two cases pain had been a noticeable feature while they maintained their bad postures, but after treatment this completely disappeared.

Pte. H. was a patient of somewhat excitable mentality, and while in the trenches had been feeling the strain of active service for some time, and finally collapsed in August 1917. He was found to be suffering from trench fever, and complained of pains in the side and back. On admission to Seale Hayne Military Hospital on 7th October 1918 he was walking very badly, with a partially bent back and a spastic-ataxic gait which had then persisted for fourteen months. Although he took rather longer than usual to cure, by the time he was discharged on 12th November 1918 he was walking and running absolutely normally.

Pte. B. acquired trench fever in France in March 1918. Since that time he complained of pains about his back and thighs. He was only able to walk with a very spastic gait, taking short steps, and he had been quite unable to run for nine months. He was admitted to Seale Hayne Hospital in the end of January 1919, and after a quarter of an hour's treatment was able to walk and run normally.

2. *Cases following Arthritis:—*

Pte. B. had had "rheumatism" in his left arm in February 1918, subsequent to which he had completely lost the use of it. He was admitted in December 1918, and persuasion rapidly induced him to carry out all movements, and by occupational re-education he was soon taught to use the left arm and hand as well as he had ever done.

Pte. E. had injured his left foot before the war by falling off a ladder. He subsequently went to France and developed "rheumatism" in the injured foot in September 1918. Since then he had only been able to walk with a marked limp and had never run since his accident five years before. He was admitted in December 1918, and was rapidly taught to trust his weight on the foot, so that he was soon walking and running normally and without pain, which had been constantly persistent before.

Pte. B. was admitted limping badly on the right foot. He had had periodic attacks of rheumatic fever since childhood, and the last attack in October 1916 had involved this ankle. He was admitted in December 1918. In twenty minutes he was persuaded to trust his weight on the injured foot and thereafter was able to walk and run without pain.

The following case of hysterical stiffness of the knees following rheumatic fever was treated by Captain J. W. Moore:—

Pte W. had had recurrent attacks of rheumatic fever for the past four years, the last one being in April 1918. When admitted to Seale Hayne Hospital in August 1918 there were no signs of active rheumatic disease, but both knees were rigidly extended, no trace of flexion having been possible since April. Treatment for eight weeks in Bath had had no effect, but manipulation and persuasion quickly induced him to bend his knees, and in half an hour he was able to walk normally after having had to depend upon crutches for four months.

The conclusions to be drawn from these examples are that in cases where there are no signs of active fibrositis or arthritis, the possibility of hysterical perpetuation of what was once an organic condition should be considered. This supposition will be supported by the fact that anti-rheumatic treatment is having no effect. In such cases psychotherapy should be undertaken straight away, with as little preliminary examination as is compatible with the exclusion of active disease. This is important, because the less handling the patient has, the more sure he will be of the physician's confidence in his ability to cure, which is one of the chief factors in successful treatment.

While the cases cited above were all military, the same conditions are met with in civil practice and the same procedure is applicable. A more critical review of chronic "rheumatic" conditions would undoubtedly bring to light very numerous cases of this description, with the result that many sufferers would be restored to functional efficiency and active health.

THE FUTURE OF THE TEACHING OF CLINICAL MEDICINE.

By T. ADDIS, M.D.,
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ANYONE who works in a medical school knows that the men who are all in common called teachers of clinical medicine tend to separate into two classes. In one class there are those who are chiefly interested in the theoretical principles underlying the practice of medicine, while in the other are those who are concerned with individual patients rather than with principles. To some, disease is of interest because they can trace in it the attempt of natural forces to right a lost balance. To others, such an idea would be secondary. They are primarily taken up with the study of the disease itself, with its correct classification, its probable course, and the methods which may be used to modify that course. One man likes to deal with the generalities of medicine, the other with its particularities. The one is a clinical physiologist, the other a practical clinician.

It is probable that among the younger men in most schools there are already those who could, without hesitation or doubt, be placed in one or other of these two groups, and it seems likely that this differentiation is part of an inevitable, though in some respects regrettable process, which in future will lead to more salient differences than any which now exist. Though there are still men who may be cited as eminent in both theoretical and practical medicine, the feat is every year becoming more difficult. If the theoretical and clinical sides of medicine continue to grow at their present rate it will soon be impossible. The coming generation of teachers will find that they are not doing anything much worth while so long as they continue to attempt to follow both of these increasingly exacting vocations. Sooner or later the natural capacity which each one has to develop a higher efficiency in one or the other will lead them to spend more and more of the time during which they are free from routine duties at what they feel they can do best. This choice of work is the beginning of the divergence between them.

For it is the antagonism in the character of their work which in the end will make their differentiation complete. The man who is drawn towards the theoretical side of medicine finds he

can make progress only by a process of exclusion and quite unnatural simplification. He constructs an artificial environment from which, as far as possible, all other factors than the one he is observing are shut out. He focusses his attention, and sharply limits his interest. He becomes absorbed in the particular technique of observation which is all that is required under the simplified conditions he has made for himself. But, unfortunately, the more he does so the more will he tend to lose the special capacities which are essential to the clinician, who cannot afford to allow his powers of observation to be limited to any one set of phenomena, who has in his work to deal with such complex conditions that he must keep his mind open to the reception of a great variety of impressions, any one of which may prove of value in the synthesis by which he arrives at his diagnosis.

This difference in the nature of their work produces two distinct types of clinical teaching. The theorist will start out to show a case of disease before the class in the orthodox manner, but before he has gone far his interest in the patient as an example of an aberration from some physiological law will break through, and he will find himself explaining symptoms and signs in terms of physiology and leading the discussion away from the particular patient to the consideration of general principles affecting groups of patients. He finds he can only really engage the thought and interest of the class when he is dealing with those aspects of the case which are of interest to himself. The clinician, on the other hand, being really interested in the clinical details of that particular patient, will be able to make them interesting to the students. He will, no doubt, also deal with the case from a general point of view, but whether he wishes it or not, the part of his teaching which is fresh and living will not be his theory, but the demonstration of his clinical acumen and the often unconscious revelation of his methods of dealing with the broad intricacies of diagnosis and treatment.

If these two types of men are allowed to go their own ways in teaching and in research, it will after a time be found that one spends all the time he can in the laboratory and in the library, while the other will be constantly in the wards and in the consulting-room. When that time comes you will have a much better clinical physiologist and a much better practical clinician than could have been obtained in any other way, but each will have the limitations as well as the virtues of his calling.

In those instances in which this process has already worked

itself out, where you have developed the pure clinical physiologist and the pure clinician, their relationship to the University tends to become a little difficult. The physiologist constantly has his shortcomings as a clinician brought home to him. He is forever having his work interrupted by the imperative demands of general medicine. But what can he do? He is known as an Assistant or an Associate Professor of Medicine, and clinical work is what he professes. And the clinician is not in any better position, for he is required not only to be a diagnostician but also to produce evidence of "original research." But his very qualities militate against his complying with this latter demand. In saying this it is not meant to be implied that the practice of medicine should not be approached in the spirit of research. But it is an immensely intricate sort of research work. It requires a vast preliminary accumulation of experience, and its experiments extend over years and decades. The young clinician can scarcely be expected to produce immediate fruit in this field. But he knows that something of the sort is expected from him, and he has an uncomfortable feeling that he should leave his real interest —the study of the natural history of disease—and either work in a laboratory with guinea-pigs or do violence to his natural propensities by treating his patients as if they were guinea-pigs.

Under the present *régime* the activities of both these men are hampered and confined, and that just at the critical period when their special capacities are beginning to bear fruit. It would seem logical to propose that the University should officially recognise the divergence between them in those cases in which the difference had developed naturally through years of apprenticeship during which both laboratory and clinical work had been done. The recognition should take the form of a relief from the the duty which they are less competent to perform. The clinician should not be required to do "research work," at least in the present narrow meaning of that word. And the clinical physiologist should not be required to undertake the treatment of patients in general. His clinical responsibility should be limited to highly specialised work related as closely as possible to the subject of his investigations.

But one of the primary functions of a medical school is the training of students to be practitioners of medicine, and it will probably occur to many that if a teacher in such a school dissociates himself from the general practice of medicine he will necessarily in time become incompetent as a teacher. They

would say he has no right to be there. They would relegate him to some institute or other. This would be a natural deduction, but I believe it is nevertheless erroneous. The clinical physiologist has an important function to perform in the medical school. It is true that he is not a clinician. But just because he has made the attempt to become one he is peculiarly fitted for the easier task of collecting the data and formulating the preliminary conclusions on which the clinician can immediately build. No one who has not an intimate and first-hand knowledge of the difficulties of clinical medicine is so well able to do this work. Physiological laws are not directly nor without qualification applicable in the practice of clinical medicine. If the clinical physiologist is kept in touch with the ward, and allowed to test his hypotheses by observations and measurements carried out on patients, he will be in a position to do far more living and useful work than if he were segregated in any institute, no matter how well equipped. But it is particularly in teaching that the clinical physiologist, if he is allowed to develop his subject, may be useful in the medical school. Most medical students at the stage at which they arrive at the clinical departments are eager to do something. They feel they have had a surfeit of theory and that it is high time they began to acquire the technique of their future calling. They are in the mood to work hard to learn the methods of physical and laboratory diagnosis, and they are eager to make their own observations on the classification, symptomatology, and course of disease. It is very essential that they should have some acquaintance with these subjects as early as possible, and it is perhaps well to indulge and take advantage of this spirit during the first year of clinical instruction. The critical time comes with the commencement of the second year. They are then for the first time in a position to begin to really think about medicine. There are two paths they can follow. They may continue to immerse themselves in the study of the practical details of medicine, in the technique of the detection of isolated abnormalities, and in learning the grouping of abnormalities characteristic of the various disease processes. And they may do this with very little reference to their already fading knowledge of biology and of physiology. Or they may do what is far more difficult, since it requires a real mental effort — they may correlate their new medical with their old premedical knowledge, and build their medicine on their physiology and pathology and anatomy. Every teacher, no matter how strongly marked his clinical tendencies, will try

to obviate this danger of a break in the continuity of medical education. But to the man whose genius lies in clinical work, this necessity for correlation is apt to present itself as a somewhat irksome duty. He has graduated from the simplicities of science to the complexities of practice, and would like to assume in the student the knowledge of these preliminary sciences which he himself possesses. On the other hand the clinical physiologist welcomes the necessity as his opportunity. This is especially his subject and what he particularly likes to teach. But it is a mistake to suppose that he can effectively teach it anywhere but in a medical school or with anything less real than a patient as his text. To put enough life into a theoretical point so that it will force its way into the thought of all the students and not merely that small percentage of them who are naturally inclined to theorise, it is almost essential to create an atmosphere of practical urgency. The theory must grow out of the need of accounting for and dealing with a concrete clinical emergency in the form of a patient before the class.

These are sound reasons for retaining the clinical physiologist in the clinical department of the school. But everyone knows that in most quarters they have already been accepted and are therefore unnecessary. There is at present no likelihood of the clinical physiologist losing his place. It is the clinician whose status is uncertain. In recent years men who are clearly of the non-clinical type have been appointed as heads of clinical departments, and the men who are sincerely interested in the practice of clinical medicine find no opportunity for advancement. This is bad business for both types of men. The clinical physiologist, as head of a clinical department, is prevented from the full exercise of his powers because he is cumbered with practical responsibilities which he is ill-adapted to meet, while the clinician, who would thrive and develop on these responsibilities, either leaves the school for private practice or forces himself to uncongenial work in the laboratory.

I am not competent to deal with the advances which would undoubtedly occur if the Universities were to recognise the practice of medicine as a distinct branch of learning.* But I should like to outline one of the paths of development which would be open

* At the time this was written I had not seen the volume entitled *An Inquiry into the Medical Curriculum by the Edinburgh Pathological Club*, Edinburgh, 1919. The first paper by Sir James Mackenzie deals with this side of the question.

to the clinical physiologist if he were not obstructed by duties which properly belong to the clinician.

The plan, in general, is to give each student an opportunity to take, independently, each of the successive steps necessary for the completion of a finished investigation. The student's own experiences, his own failures, and his own successes, will teach him.

A few simple, easy, and accurate methods will be chosen as instruments for class research. In the circulatory system, for instance, pulse-rate and blood-pressure measurements. In the respiratory, O_2 and CO_2 estimations. In the excretory, volume, specific gravity, chloride and urea determinations. With these the class would approach each subject in an attitude of scientific detachment, based on admitted ignorance.

We shall put it to them that the treatment of patients should in part depend on an exact and detailed knowledge of any significant deviations from normal function which may have been induced by disease. This knowledge, we shall say, is yet to be obtained. We do not even know what "normal function" is. We therefore, first of all, want you to establish a standard of normality.

Suppose we take the cardiovascular system. We should first train ourselves in small groups by a checking system to accuracy and uniformity in pulse-rate and blood-pressure measurements. We should then discuss the conditions under which our standard is to be worked out, and demonstrate the value of selecting conditions involving the strain of muscular effort and the strain induced by sudden change of position. This done, we could pass to the accumulation of data, with ourselves as the subjects. With a class of moderate size it would not take long to obtain a statistically significant number of observations, and we could proceed to the methods of tabulating, averaging, charting, and correlating our figures. The limits of normal variation thus defined by the class would be compared and united with the determinations of previous classes, and we should have a constantly growing mass of information. The class would know that they were not simply playing at research, that they were seriously engaged in an actual investigation. But the greatest educational value would come from the student's attempt to explain the phenomena he had measured. It would give him a training in initiative, and throw him back for help on his physiology. And it would be only after he had made and recorded his conclusions that the instructor would give him a

list of the literature pertinent to the subject, and would require him to revise his ideas in the light of the experience of others, and would lead him to instructed and balanced conclusions.

So far such a course of "clinical physiology" would be pure physiology, but from this point it would become definitely clinical. With the same methods and under the same conditions the functional reactions of patients would be measured. In attempting to explain any significant deviation from normality we should have a detailed and specific physiological knowledge as a basis, but in each case all the facts elicited by a careful history and physical examination would be considered. Here pathology as well as physiology would be required, and the necessity for individualisation in diagnosis and treatment would be demonstrated. The various hypotheses advanced by students in explanation of abnormalities of function would be discussed and criticised by the class and their validity tested by subsidiary experiments.

No doubt we should often fail to solve our clinical problems. That would be no great matter. The essential thing is that we should have had an opportunity to do some real medical thinking, and that in itself is an education to the student. Teachers often note how students make correct observations, but entirely fail to correlate and synthesise their observations. But this is often a virtue rather than a fault on the part of the student. For thought not based on established fact is simply random conjecture. They do not possess the largely subconscious background of experience which in the mind of the clinician links together the observations which to them seem so disconnected. This course is designed to give them a background. It is true that it will cover only a very minute fraction of the field of medicine. But it will be simple and concrete. It will be food for real thought. It will be a beginning which individual initiative may extend indefinitely.

An obvious objection to the scheme is that it will require too much time. But in this connection there are three points to be remembered. First the methods used will be of the utmost simplicity. No time will be wasted on mere technique. Second, the number of investigators will be so large that the accumulation of data will not require much time. A large part of each period will be devoted to criticism and discussion, and all the reading and most of the thinking will be done out of class hours. Lastly, there is no need to take up more than one or two subjects. The

instructor could confine the course to those in which his own mistakes had qualified him to be a guide. Even so he will have to work hard to keep up with the class. Each period will have to be carefully prepared for, so that the student's time need not be spent in routine technical detail. The written opinions of the class will have to be read and criticised, and the instructor should arrange for time out of class hours during which he would be available to any member of the class for private discussions on questions of interpretation of data. It is not a method of teaching which the clinical physiologist can hope to make successful so long as his time and attention are distracted by the claims of practical work in clinical medicine or the necessity of teaching the technique of physical or laboratory diagnosis.

It has been objected by some that the undeniable tendency towards a separation into groups of investigators and practitioners should at all costs be prevented. Clinical medicine, they say, which used to be entirely empirical, is gradually coming to be more and more permeated by the spirit of investigation. In order to ensure that this advance shall be permanent they think it essential that the teacher of medicine should lead a double life, half in the laboratory and half in the consulting-room. They regard what is proposed in this paper as a retrograde movement, because they believe that if the clinical physiologist were allowed freedom to develop along his own lines he would soon become a pure physiologist, and that if the man with a strong clinical bent were not forced to continue work in the laboratory he would soon degenerate into the clinician of fifty years ago.

I do not believe there is any reason for these fears. It is not possible for a man who for years has shouldered clinical responsibility ever to lose his clinical point of view. Nor can a man who has successfully carried through an original investigation ever relapse into the uncritical and credulous attitude of old-time medicine. The danger is in the other direction. The investigator is apt to be led by his sense of the immediate urgency of clinical needs into work which promises quick returns, work predoomed to failure because it is not sufficiently fundamental. Most problems in functional pathology are not open to direct attack. They require many years of purely physical, chemical, or physiological work before they can be even approached. The investigator should be encouraged in this work, however far it may seem to take him from the clinic, so long as he keeps the patient for whom in the end he is working always clearly in view. The

clinician, on the other hand, is apt to be deterred, by the prevailing false conception that research necessarily means laboratory work, from contributing by close observation and correlation of clinical phenomena to the knowledge which has been handed down to us. It is in the ward and not in the laboratory that he should use a critical judgment in the revision and extension of this knowledge.

Both of these men should be on a "whole-time" basis. Their salaries should not be less nor more than is sufficient to keep them and their families in comfort. There should be no inequality of academic status between them. The clinician should have direct responsibility for the care of all hospital patients with the exception of a few selected by the clinical physiologist because of their connection with his work or with its ultimate purposes. Under these conditions of freedom neither would in any way be thwarted in their work, and both together could give the student a well-balanced philosophical and practical conception of clinical medicine.

A FIELD AMBULANCE IN GALLIPOLI, EGYPT, PALESTINE, AND FRANCE.

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XVIII. Off to Jerusalem.

From the time when we first placed foot on the Judean hills our difficulties began to pile one on the top of the other. Starting from the lower slopes, the hills are covered throughout their entire extent with boulders of all sizes, which have broken from the parent limestone. They are scattered thickly over the surface of the hills from base to summit, and give to them, and to the valleys between, an appearance of singular wildness, and in some places a certain element of stern grandeur such as one occasionally sees in the remote recesses of the Scottish Highlands.

The rocky character of the ground is too inhospitable by nature to support any considerable vegetative growth, and the barrenness of the country adds to the general impression of wild sternness. Not even a camel could get sufficient to nibble. But every here and there, by the exercise of a considerable degree of patient husbandry, the loose earth has been gathered together into terraces for vines, which hang on precariously to the hill slopes. And then, in the valleys especially, one meets with a certain number of trees.

But the dominating impression made on our minds, as we found ourselves thrust amongst the mountains, was the apparent hopelessness of our task. For how were we to carry our transport over these rugged hills and along these rock-strewn valleys? The first few days were days of great anxiety, for cleave our way through we must, unless we were prepared to admit defeat. And that could never be.

We soon found that the roads marked on our maps either did not exist or they were mere tracks zig-zagging between the boulders, along which it was often difficult to lead a horse. The Roman road shown on our maps in double lines, which in our innocence we imagined would solve our difficulties, we found had probably been a road, and perhaps it had been a good road in the time of the Romans. We were prepared to admit that, more from our knowledge of the Romans than from the appearance of the road. It had little evidence of having received any attention since

these ancient times. But we had to make the best of a bad job, and time was pressing.

It is eminently true in war that where there is a will there is a way. War is above all a supreme test of the simple human virtues of determination and endurance. The rarer qualities of intellect and genius, which find their opportunity at every step in ordinary life, find their place also in the field, but it is the simpler virtues that dominate. Courage, drive, and power which endure against heavy odds, which neither flinch nor fail, but increase in measure as the difficulties and the dangers threaten to engulf in disaster the individual, the platoon, the battalion, or the army. "Courage never to submit or yield, and what is more, never to be overcome." Find these men wherever they are and trust them with a complete trust, for they will never fail. And, if war has done anything, it has shown that the "happy warrior" of the poet is to be found wherever you go amongst the simple, modest hearts of our citizen army. They are not one or two, but many, who stand in their simple heroic strength, a theme for the poet's song.

I doubt if there have been many occasions in the whole history of war when there was a greater demand on the strength and the persisting endurance of a body of men than was made of the division which now found itself thrust into the rocky, trackless wastes of these Judean hills. As we stood on the lower slopes, which we had reached with our paraphernalia of camels, horses, waggons, and guns, we looked up at the rugged heights approached by tortuous tracks hanging in the air, where they were hewn across the face of the limestone. And we wondered how we could ever climb these mountain steeps and take with us our long procession. Guns, and waggons, and, greatest problem of all, camels!

But for us at that stage the greatest obstacles that sprang into our path were there to be overcome. The fire of victory was coursing through our veins, rebuking all denial. The Turk was there in front, creeping back from height to height, watching us with eagle eye as we struggled on, but ever refusing battle. And last, and greatest of all, Jerusalem, hidden away in the fastnesses of the upper mountains, lay beckoning to us with a call that stirred our pulse and made our hearts bound with keen, impatient desire.

We thought of the Crusaders of old, of Cœur-de-Lion, of Godfrey de Bouillon, and all the rest, who challenged these mountain ramparts to free the Holy City from the bond of the

Saracen. We thought, with a sympathy born of kindred struggle, of the despair and disaster that often followed them. And, as our goal was being reached, we began to feel our hearts burning with the spirit's flame—the flame of battle in a holy cause handed down from those strong heroes of chivalry and renown, whose footsteps we were treading these long centuries after.

We felt that every rock was hallowed by sacred memories. Every peak as it looked down on us in its stern, unchanging dignity, had watched the hundred holy battles that swayed to and fro along the valleys round Jerusalem. And we felt that they stood over us in judgment.

It is given to few, even in this world-wide war, to experience the chords of feeling and of action vibrating to eternal music such as was our lot during these days.

We were proud in the glory of the task in which we were engaged. We were proud of the division to which we belonged, and of the Scottish lads, whose brave dauntless hearts had accomplished in a few short days deeds that would ring down the years. And we were proud of our general, whose leadership had led us on from triumph to triumph, and whose brave, strong optimism had awakened a responsive chord in our being. So that at his bidding we would march on through danger and death to our goal.

To understand the problems that hedged us round you must remember that a field ambulance consists almost entirely of transport. The few hundred men that form the personnel are as helpless as a man stricken with paralysis in the absence of the equipment, dressings, and instruments carried by the long train and without the waggons and animals to transport the wounded from the battle.

And in the beginning there pressed on us with an insistence, which we now recall, the fact that we were almost wholly dependent on the camel. We had mule-drawn carts for our patients in large number but for our stores and necessaries the camel was our only stand-by. And without him even our large horse transport would not more than touch the problems of evacuation of the wounded after an action.

The camel was a desert animal, born and reared and adapted with a perfect adaptation for the soft sands and African heat. Most of our camels were drawn from the deserts of Africa. And here we were thrust into regions the very antithesis in climate

and ground of his natural habitat. Instead of the soft sand plains and the warm sunny skies of his birth, we had dragged him with us in amongst mountains of hard rock with sharp fragments at every step, and wet and cold weather which chilled even our northern blood. And he carried the whole load of an army on his back.

It was a problem to shake our trust and make us tremble with anxious fear. But our fears were beginning to resolve, for already the miracle had been wrought. We had watched him as he accompanied us across the lower foothills that led to Berfilya and he showed no sign of faltering on the unwonten tracks. His gait of deliberate stateliness might be disturbed a trifle by the rocks that strewed the path, but neither by sign nor action did he ever express his grievance. Nor during the whole period of our constant trekking amongst the hills, until we finally left them some time after, did we ever experience any disaster with our camel convoys.

The camel had now woven for us associations of a character almost sacred. And the associations were not for us only. The whole division relied on him and their trust was never belied. In the beginning the tons of baggage and the impedimenta of war carried on the many hundred backs of that long moving procession had been necessary to our success in the field. Before the end we were dependent on him for the very maintenance of life itself. Without him, with our base so many miles behind, we must have starved.

Is it to be wondered at if we tended him with a care that knew no end? We lightened his loads when the way was long. We bathed his feet when, as occurred now and then, they were torn, and we did not rest until we had found him drink, when this was due. And in our care for him there was more than the thought of expediency and a base return for our labour. But did he realise our solicitude for his welfare? It is doubtful. Never by look or deed did he ever exhibit a vestige of gratitude.

XIX. Battle in the Rocky Hills of Judea.

The next few days saw the troops on the move across the hills and along the defiles towards Jerusalem. It was to be our task to turn from the west and north the positions which the Turks had taken up to guard the Holy City. The decision was taken, and come what might the rocky ramparts were to be seized before the Turk had time to recover from his plight. For every day

was precious as gold. In a short period, reinforcements and guns would stiffen the defences on these mountain battlements so that an army would batter itself against them in vain.

By this time the weather had broken, and the discomforts of the elements were added to the difficulties of the passage. The men were marching light, and the animals were carrying only what was essential for battle. Blankets and bivouac sheets could not be carried when food and ammunition were in jeopardy. There was no shelter from the rain that poured from the opened heavens in drenching sheets. Nothing but the cold stone-strewn hills that stood round frowning on our misery, the emblem of cold inhospitableness. It is during the night time that in Syria the elements give full vent to their rage, and the nights we spent crouching cold and wet against the barren rocks we can never forget. But with day the sun will break through the clouds, and the discomforts of the night are forgotten at the touch of his diffusive warmth.

Patrols had gone out to search the path, and it was decided to push on by the track along which we had forced our passage to Berfilya. This continues in a twisting, precipitous course across the hills parallel to, and some three or four miles north of, the main Jaffa to Jerusalem road.

The brigade we served arrived at Berfilya on the 19th. It spent the night there, and on the following morning set off in a narrow column up the track towards Beit Likia, about seven miles distant. The other two brigades of the division had moved on ahead, and were already engaged in the hills north-west of Jerusalem.

On the trek to Beit Likia the expected happened. Half the ambulance carts of the mobile section were broken on the way. The wheels and axles twisted under the strain, and some of the carts had to be forsaken. Those that were taken to the journey's end only reached there by being man-handled over the rocks and boulders on the road. From this time onwards we had to resign ourselves to the absence of these useful, and in some ways essential, part of our transport. They could be taken no further. But by this time the camel had asserted his position, and the breach was partly filled.

The remainder of the ambulance joined up at Beit Likia on the 22nd, and early the next morning the order to advance was received. This, as it turned out, was to be the last stage of our journey towards Jerusalem. It was in some ways the most

arduous of all. We fell in behind the column about seven in the morning, and did not reach our destination, six short miles along the track, till seven at night.

The scenes of that day can never be effaced from memory. The way, after twisting across the flatter ground on which Beit Likia is situated, strikes straight for a rocky track that courses between the higher hills. Throughout, it is only wide enough for the passage of a horse or a camel at a time, and even then the footing is insecure. Along this mountain track the column that day pushed its way at the rate of half a mile an hour, and this rate could not be exceeded with all the will in the world. By this time we were climbing rapidly, and at times the slope of the ascent in front of us looked such as no horse or camel could scale. But still the winding column moved slowly on, upwards and ever upwards.

Every now and then we would halt as a horseman or camel coming in the opposite direction crushed past, and the passing camel men greeted one another in angry tones at the interruption. Here and there the column was checked whilst a camel, which had stumbled and loosened its load, was gently led aside amongst the rocks to have its bundle done up anew. At one place we passed guns and limbers which had pushed recklessly on across crag and boulder, but which were now stuck at last with horses that poured rivers of sweat still hooked in. Step by step we picked our course until we were over two thousand feet above the sea.

Shut in on all sides by the grey speckled hills there was nothing to attract our attention from the path except here and there where we saw a dull-grey native village clinging to a hillside or perched on a hill-top. You rarely find a village set on a plain in Syria. The most remote slope or the actual summit of the hill is chosen, and in many cases the site looks as if selected for its inaccessibility from the surrounding valleys. We remember also at one place, after we had been climbing abruptly for some considerable time, turning our eyes, and finding outstretched before us, in a gap between the peaks, the long expanse of the plain of Sharon, with Ludd and Ramleh in the nearer distance, and far back, standing on the shore, the large town of Jaffa. Behind it all, the Mediterranean sparkled in the setting sun, with the warships riding on its surface, and showing in the distance as small black specks. A few more steps, and this panorama was blotted from our sight. As we reached the higher levels, every now and then

we got a sight of the prominent peak of Neby Samwil with its tower shining white as it caught the sun.

After long, weary hours we reached the summit of the range where the ground was more level, and the track broadened out so that in places two or even three camels could march abreast. Our pace was quickened, and before long we passed the straggling village of Beit Anan, and then, just as the light was failing, we marched into Kubeibeh. The brigade moved on to Biddu, a mile or two further. The main station halted at Kubeibeh.

This village is sacred to all Christians as being the site of the Emmaus of the New Testament from which the Ascension of our Lord took place. It possesses a large German church and monastery and a hostel, where pilgrims are housed during the summer months, run by a German Countess and German sisters.

We were now within a mile or two of the Turkish positions, and the tracks round the village were being shelled by the Turk to embarrass the moving troops. Within an hour or two of our arrival we learnt that the division was moving to the assault in the morning. So we had to hunt about in the dark for a site for our ambulance. We selected some outhouses adjoining the monastery, and all night long we worked at our preparations for the morrow's battle. The largest room of our house was scrubbed clean, and before long it was fitted out with all the trappings of an operating theatre, and we were ready for the performance of even the most major surgery.

In the field ambulance, for several reasons, one avoids as far as possible the carrying out of serious surgical treatment. Our function is to collect and pass on to the casualty clearing station, where the wounded are received in comfort and leisure. We must be mobile all the time, for to-morrow we may be many miles away. But there are times when all rules must give way to the inexorable force of circumstances, and for us such a time had now arrived.

We had outstripped by our rapid advance the more slowly moving hospitals behind. We could not fairly expect them to overtake us for many days. But more compelling still, we were perched on the rugged heights hemmed in all round by wastes of rock over which the carriage of a severely wounded man was impossible. We had lost our carts and the camel alone was left, and we knew that even a short journey with this animal might jostle to death a man sorely hit. We decided without hesitation that, come what might, we would hold our severest cases at

Kubeibeh, and with day we would search for the shortest camel path southwards across the hills to the main road by which to evacuate our slighter cases.

We were surprised to find another division of troops in Kubeibeh and the neighbourhood on our arrival. They had come straight across country driving the Turks before them. They had only come to a stand when, after a severe fight, they had been held up by the heights that guard Jerusalem on the west and northwards.

We were soon in touch with them, and ere long we had extracted all the information they could give about the places and about the best way to deal with our casualties.

When day broke on the 24th November it found us ready.

The scene that burst on our eyes that morning we shall never forget. We found ourselves on the summit of a ridge with the same grey rock-covered hills all round. On the south the ground dipped down into a hollow and then rose abruptly for some hundreds of feet, with a track winding upwards along its face. On this strings of moving camels could already be seen, with the zinc water-tanks which they carried flashing brightly in the sun. They had caught the eye of the Turk from the hills to the north, and he was vainly trying to drop shells along the path.

To the west the road by which we had come climbed slightly and then was lost to sight where it disappeared into the hollow. Just before it disappeared it skirted a prominent summit some half mile away on which a small white building was placed. From this house an extensive view all round was to be obtained, and it had been built there for this purpose. We remember, some weeks after, picking it out distinctly among the black hills when we lay many miles away on the sand-hills north of Jaffa.

As you stand in the garden of the hostel and look towards the north you see the ridge on which Kubeibeh is placed falling away rapidly in terraces to the valley. To the left the ground rises into a summit crowned by the village of Beit Dukku, whilst in front it rises in long slopes of boulders and jagged rocks to the heights on which Beitunia and away beyond this Ram Allah are placed. The flat-roofed houses of the distant villages as they lie perched on the summits show out in sharp silhouette on the sky-line.

To the east the road struggles across boulders through the village of Kubeibeh, past the German monastery on the left and an orchard garden on the right. Further on the road slopes upwards to Biddu. Beyond, standing out some miles away, the

most prominent height in the range of hills is Neby Samwil (Mizpah), a sharp eminence surmounted by a church and tower, which were early smashed by Turkish fire. It was from this height that the Crusaders of old caught their first vision splendid of the Eternal City. It is visible for many miles away on all sides, and continually springs into view as one passes along the winding road towards Jerusalem.

From the hill overlooking Kubeibeh some of our party during a spell of leisure got a glimpse of Jerusalem and the Mount of Olives lying to the south-east some six miles away, with the distant range of Moab behind. It was a hurried view, and in the heat of battle there was little time for meditation and exaltation. As it turned out, our division was destined never to enter the Holy City. Except for the hurried distant glimpse obtained by the fortunate few during these days, and some pilgrimages made some weeks after, when we had left the hills behind us, the vision of the city of eternal glory was denied to us.

With the early morning the troops moved forward, and before long the assault on the line of crests was in full swing. El Jib, Jedireh, Kulundia, and Neby Samwil were to be taken, and pushing forward, the division was to place itself astride the Jerusalem-Jericho road on the north.

The advanced dressing station was established close to brigade headquarters near Beit Izza on the west slope of the bare hill. Here it remained all day with battle seething round the little colony of white tents. Near by lay the barracked rows of the ambulance camels. Along the track that ran close to the station, men, horses, and camels in constant procession passed backwards and forwards, regardless of the Turkish shells that fell all day long. As they struck the rocks they burst with a loud clash, splitting the boulders in splinters that flew far and wide. Unlike other battles in which we had taken our part, there were here only a few guns supporting the attack. We could hear a battery firing its utmost from the hills over beside us, whilst a few yards behind some mountain guns, whose sudden barking snap made more noise than their size seemed to warrant, stood their ground all day. There was no shelter for them. They were on the open hillside in full view of the Turk, and shrapnel and high explosive burst round them all the time. But, with a defiance of danger which won the admiration of all, the gunners plied their little guns without pause.

As the troops advanced, the ambulance camels were pushed

forward from the dressing station towards the battalions in order to shorten the interval of carriage for the stretcher-bearers. For the transport of the wounded across the slopes of rock was the hardest and slowest task our men had ever experienced. But organising our camel service to suit the usual needs of our time we managed to remove the casualties from the battalion medical posts as they were collected by the medical officers.

With nightfall, it became apparent that all the strongholds which our division were storming could not be captured that day, and the order to retire was given. To another division was to be left the completion of the assault. Large numbers of camels were pushed forward to clear the field of wounded. This was carried out without a hitch. The brigade which we served withdrew to Kubeibeh, and the advanced station rejoined the parent body of the ambulance near the monastery.

Next day all the less serious cases were sent southwards across the hills to the station which we had established at Enab, on the main Jerusalem road, where they were picked up by motor ambulance cars. The severe cases which had been treated at the hospital opened in the grounds of the hostel were handed over to the care of another ambulance which had meanwhile arrived. For we had again received marching orders, and within a few hours our long procession was on the move backwards by the track which we had traversed a few days before.

We were off to Jaffa and the sea to rest and recoup! For, after weeks of hard marching and hard fighting, the men were worn and their numbers thinned. Recently, the nights spent on the mountains had been excessively cold and wet and there had been no sleep for the men, except for brief snatches when in utter exhaustion they threw themselves down on the bleak hillside with a rock for their bed. There was no natural shelter against the elements anywhere, and the blankets and bivouacs had been dumped many miles back during the early days of the rapid advance to lighten the animals and to enable the bare necessaries in food and ammunition to be carried.

It is not surprising that the men were tired and worn. But their mettle was keen, and with the days of stiff marching and exposure to sun and mountain air their muscles were iron-hard and their skin was tanned a deep hue. A few days beside soap and water, with mountains of food and gallons of tea and leisure to enjoy them, and, greatest desire of all, one long, deep, warm sleep with no sergeant to cut it rudely short! Just to sleep and

sleep with nothing to rouse you but the gentle awakening of nature satisfied.

We left Kubeibeh on the 26th, and halted at Beit Sera, which lies at the north end of the valley of Ajalon where Joshua defeated in bloody slaughter the enormous host gathered against him. We were to stay here over-night and continue our journey towards the sea, so we thought, on the following day. But we had not yet finished with our battles, for next morning the Turk launched a strong attack on the front just opposite us. He hoped to break through our line and seizing the heights that encircled the valley of Ajalon to deal a vital blow at our communications. Had he succeeded it might have led to serious results, for our two main roads stretched across the north and south ends of the plain, and with the heights in the hands of the enemy they would have been immediately dominated by his guns. Instead of continuing on our road to the sea, we found ourselves thrust into the gap which the Turk had made in our line at his first vigorous rush in the early morning. For some hours there was a lively fight, but the Turk was soon brought to a standstill, and this last attempt to relieve the troops guarding Jerusalem by striking a blow at our lines of communication was doomed to failure.

XX. Jaffa—Crossing of River Auja—Good-bye to Palestine.

We were now able to continue our journey westward. On the 2nd December we were bivouacked in an open field on the west side of Ramleh. The division several days afterwards moved into the line on the shore sector in front of Jaffa, and on the 8th the main dressing station established itself in the spacious Jewish school in this town.

The next weeks were spent in a complete overhaul of man, beast, and cart. The clothes of the men which had been tattered by the heavy days of trek were replaced by new garments drawn from ordnance, supplied with a view to the winter which was now on us. We had lost a number of horses which had fallen exhausted by the way or which had been shot, for on the trek a sick horse is an encumbrance which must be got rid of. Only animals fit and strong are worth their feed, which during a rapid advance is never plentiful. We obtained new horses from remounts. On the whole the animals emerged from the ordeal of the preceding weeks in a way which surprised us all. This was

especially true of the camels. Of them we lost very few during the march, and these mostly from shell-fire. After a few weeks' rest and feeding their flanks soon filled out again and their coats soon recovered their gloss of health. Then we had to draw waggons from ordnance to replace those which had succumbed on the Judean hills. Those we still had were bent and worn and were soon in the workshops being hammered into shape.

Our stay in Jaffa is full of pleasing memories. Our residence was taken up in the Jewish colony of Tel Aviv, which stands on the sand on the north-east of the native town. It is a colony which was founded only twelve short years ago by a body of Jewish idealists who came from Russia fired with the desire of founding a self-supporting settlement in the land of their fathers. Combining the practical and the ideal in quite a remarkable manner, they had built up step by step on the bare patch of desert sand a thriving township which in time of peace had a population of five thousand souls. The Jewish mind is essentially artistic. This expresses itself at all times and in all places, though it is often stunted and withered by the bondage and repression of their adopted countries. With the memory of the pogrom behind them and the opening out of new prospects of comparative liberty of action and self-expression the fine qualities of the Jew found ampler opportunity for their revelation in this new colony.

The intense vitality and love of life, which is the dominating character of the Jew, here also found free space for its action. Life surrounded by the beautifying and ennobling influences of art, labour running in channels free and strong, embosomed in love and poetry and music, were the ideals which animated this small and distant outpost of Jewish culture. As a background and setting to their activities and a waking dream which fired their spirit and stirred their imagination was the glorious vision of Palestine peopled by their own best stock. Already, when we were there, the pronouncement of the British Government about the future fate of the country had reached them, and was hailed with an enthusiasm which we can only understand when we remember that this had been their constant dream for many years, and, at last, surrounded by the security of the British promise, its fruition was as good as assured.

The greatest care had been given to the planning of the little town. The houses had been built to the schemes of the best

architects. They were small, painted in light and pleasing colour, and each surrounded by its garden.

When we arrived an atmosphere of unkemptness and disrepair surrounded everything. For months before the great majority of the inhabitants had been exiled by the Turk. They had been sent to Damascus, Haifa, Tiberias, and other towns further north. As a concession the Turk allowed ten of the men to remain behind to safeguard the property of the owners.

A number of the exiles were liberated as our troops captured the villages and towns to which they had been scattered, such as Sheikh Muannis and Mulebbis, and the Jews seizing the opportunity made back to Tel Aviv. Many a procession of weary exiles we saw during these days crossing the country on foot or mounted on any animals or carts which they could lay hands on for the occasion. Camels which were often borrowed from the army would be seen laden with beds and bedding, chairs and tables, and the other household belongings which the captives had taken with them into their exile.

Within a short time a thousand or two—men, women, and children—many suffering from the effects of their harsh captivity, had wandered back to Tel Aviv. There was soon a stir of life throughout the place. The schools were opened, the Jewish hospital, renewed with equipment sent from Egypt, was working, and in many other respects the broken threads of life were taken up anew. Before we left we had the pleasure of listening to a classical concert of a very high standard provided by Jewish musicians.

For several weeks we had the opportunity of mixing on intimate terms with the people. They did not conceal the pleasure they felt in the company of the soldiers who had freed them from their taskmasters. For thriving and peaceful as their colonisation had been, it had received many harsh blows and little encouragement from the Turk, and since the war the terms on which they lived with their masters had been more strained than ever. For the Turk could not but know that their sympathies lay with the army which was advancing from Sinai into Palestine.

The next months of our stay in the Holy Land were for the most part uneventful. Some days before Christmas the division was thrown into battle again. In front of us lay the River Auja, a deep-flowing stream about forty or fifty yards wide. This was the first perennial river we had met since we left the Nile. The

Turk was in occupation of the high land on the opposite side. His positions were strong, and he seemed to be secure with the river flowing between. But the decision was made. In secret portable rafts were constructed, and on a night of wind and rain, when the Turk must have thought that his security was never more unlikely to suffer rude disturbance, the brigades crossed the river and fell on the Turk in his defences with a suddenness which took him completely by surprise. It was a masterpiece of daring planning and perfect execution. The Turk was driven back, and within a few days we were in occupation of all the high land which we required to secure our coastal flank.

This was the last battle which we were to take part in in Palestine. It was almost bloodless, and great as were the ambulance preparations in view of the difficult and unusual nature of the attack, we were almost uncalled on. No battle of such importance had ever found us so inactive, and it is not inappropriate that our last fight in the Holy Land should have ended so satisfactorily for our arms.

Within a few weeks the call to other climes came, and with feelings that were mingled, but in which there was a distinct element of regret, we bade good-bye to the country on whose altar we had laid so much of our best young blood and of our best effort.

(*To be continued.*)

OBITUARY.

Professor W. S. GREENFIELD.

On the 12th of August 1919, William Smith Greenfield, Professor of Pathology in the University of Edinburgh from 1881 to 1912, died at Juniper Green at the age of 73.

To those who knew him well, he was one of the most stimulating of that band of teachers who by their originality of thought have done so much to maintain the high reputation of the Edinburgh School of Medicine in recent years; and the result of his influence on the best type of intellect amongst his students may be estimated by the number of his pupils who now hold professorships in pathology and cognate subjects, or who have attained to eminence as consultants. The latter group contains many well-known names, for Professor Greenfield was not a pathologist only.

In some respects his work as a clinician appealed to his students even more strongly than his pathological researches, and although he recognised that the increasing development of medical science necessitated a certain degree of specialisation, he always held, like Sir James Mackenzie, that teachers in the Faculty of Medicine, charged with the task of training the practitioners of the future for their life work, must keep in effective touch with the clinical side of disease. With Sir James Mackenzie he also believed that a mere knowledge of the end products of morbid action as seen in the post-mortem room and under the microscope, though invaluable as adjuncts, could never serve as substitutes for direct clinical study, if the development and advance of disease were to be really understood or successfully treated.

To those of us who knew him during the later years of his life it is interesting to find that this was his clear opinion from the day that he assumed his duties as a professor.

In his letter of application for the Edinburgh Chair the following sentences occur, and show how definitely his mind had shaped itself to this conclusion. "But while," he writes, "I should ever regard it as a primary duty to carry out thoroughly the teaching of pathology in all its branches, so far as it can be taught by lectures, demonstrations, and laboratory work, I do not believe that a subject which is so intimately associated with the processes of disease can be properly studied or taught apart from their practical study by the bedside; nor do I consider that such a separation would eventually prove advantageous either to the science of pathology or to its utility as a department of medical education. My professional pursuits hitherto qualify me, I trust, for continuing the combination of clinical teaching with

that of pathology proper, as hitherto practised by universal consent, to the great advantage of the students of your University." This outlook he maintained throughout all the years during which he filled the Chair, and it was no low standard of clinical efficiency that would satisfy him either as regarded himself or his students.

The main outlines of Professor Greenfield's life can be easily summarised, for his devotion to his duties as a teacher left him little time to devote to medical politics, and indeed his mental equipment was too sensitive to make him happy in such work.

Born at Salisbury in 1846, he in due course decided to follow the profession of medicine, and after a distinguished career as an undergraduate in University College and Hospital, he graduated M.B. and B.S. of London University in 1872. Two years thereafter he obtained the degree of M.D. there, and was also admitted to the membership of the Royal College of Physicians. He became a Fellow of the College in 1879. From 1872 to 1874 he acted as Medical Registrar at St. Thomas's Hospital, and in the autumn of 1874 he was appointed Demonstrator of Morbid Anatomy and Pathology to that hospital, a task which he discharged for nearly five years. During that time he gained a very wide experience of pathology, for, in addition to his duties as a demonstrator, he performed on an average more than three hundred autopsies annually, many of them on cases whose clinical history he had been able to follow in the hospital.

This work laid the foundation of his reputation as a pathologist, and during this period he was diligent in publishing papers of a very high order in the *Transactions of the Pathological Society of London.* His plan of work was to select from his copious material groups of cases likely to throw new light on the pathology of disease, and to study them with great care. Amongst the most notable of his contributions based on this careful and systematic work were those on the "Pathology of Visceral Syphilis," of "Lymphadenoma," of "Pyæmia," and of "Granular Contracted Kidney."

At the close of 1874 he received the additional appointment of Lecturer on Morbid Anatomy and Practical Pathology. In the discharge of these new duties he, for the first time in the history of the school, held a class of Practical Pathological Histology. It soon became exceedingly popular. Started as a voluntary course, and attended during the first session by only a handful of students, at the end of six years the attendance had risen to eighty, and the roll contained, not only the names of undergraduate students but also those of numerous graduates who had had no previous connection with St. Thomas's Hospital. This course was the model on which he subsequently formed his practical classes in Edinburgh, where they

constituted a notable advance on anything that had previously been attempted in the department of pathology there.

In 1878 he was appointed by the Senate of the University of London to the post of Professor of Pathology in the Brown Institution in succession to Dr. Burdon Sanderson. His duties there were mainly to prosecute investigations in Human and Comparative Pathology, and to superintend the work of others in that direction. This necessitated the resignation of his appointment as Pathologist to St. Thomas's Hospital, but in some respects this was a gain as it gave more time for original research. The result of this is shown in the long list of papers, some of them epoch-making, which appeared during his tenure of this office. These include studies in "Pyæmia," "Septicæmia," and above all, on "Anthrax," which he was the first to prove was identical with "woolsorters' disease." He not only worked out the bacteriology of this disease, but was successful in demonstrating a method by which the virulence of the organism could be greatly lessened, and in so doing was a pioneer in the study of immunity, for it must be noted that this work was accomplished before the end of 1880.

During these years he also continued his studies on the kidney, and wrote the section on the diseases of that organ for the New Sydenham Society's *Atlas of Pathology.* He also translated and published Lanceraux's *Atlas of Pathological Anatomy* with original additions by himself—including a number of new plates.

Thus it was that by the time he became an applicant for the Edinburgh Chair at the age of 35 he had an assured reputation as a pathologist and teacher.

His letter of application was reinforced by the titles of more than forty contributions to pathological literature, and his application was fortified by testimonials from such men as Paget, Burdon Sanderson, Quain, Hughlings Jackson, Barlow, and Charcot, to mention but a few of his supporters.

When he received the appointment to the Edinburgh Chair he had to face a task fraught with difficulty.

The subject of pathology did not hold that place in the curriculum which its importance justified it in claiming, and there were elements of opposition to be overcome which remained as an aftermath of the keenly contested appointment. But with characteristic determination the new Professor applied himself to the task of reconstruction; and in his department in the University he built up, with the aid of his young assistant, now Sir G. Sims Woodhead, a series of courses which revolutionised the teaching of pathology and which has served as a model for other universities to copy.

During the period of his Edinburgh activities Professor Greenfield had comparatively little leisure to continue his contributions to patho-

logical literature, for his day's work with its clinical teaching, its systematic lecture on pathology, and the supervision of the work in the laboratories of his department made a heavy claim on his strength and his time.

As a clinician he gathered around him many of the keenest students and they were greatly influenced by his work in the wards. The ordinary student, however, who worked for a bare pass, usually avoided Professor Greenfield, for he not only found that more was expected of him than he was able to give, but also he experienced the discomfort of having his ignorance very trenchantly displayed for the benefit of the rest of the clinique. Diagnosis, with Greenfield, formed not only the fundamental basis, but also the main theme of his cliniques, and the student who could not arrive at a fairly accurate diagnosis by the process of exclusion was apt to have his pride badly ruffled by the end of the hour. Those who faced the ordeal, however, soon found the benefit of his teaching, and their clinical knowledge increased by leaps and bounds. Whilst diagnosis formed the chief topic of his cliniques he never omitted to discuss treatment also, and those who watched the skill with which he used drugs in the wards and who knew how deeply he interested himself in the welfare and progress of all his patients there, realised that he asked of others far less than he habitually demanded of himself.

To senior students and young graduates who were working in his laboratories he applied the same type of searching examination, he never indulged them with "spoon feeding," or rendered the path of research easier by clearing away difficulties for them. He rather forced them to think for themselves, to prove all things, and to be at pains to demarcate the boundaries between what they really knew and what they only thought they perhaps knew. At the same time he never discouraged a worker who confessed his ignorance but with infinite pains put him on the road to knowledge.

As a lecturer, Professor Greenfield was not wholly free from faults. He was often too anxious to guard against overlooking the exceptions to a rule and too balanced in his critical estimate of opposing theories, to leave in the mind of junior students of pathology a clear idea of the point they had arrived at; though at a later stage of their studies they often found in their notes many illuminating ideas which they had not fully appreciated at the time. In fact, for junior students the lectures were too full of matter and too elaborate to give that lead which it is one of the main functions of teaching by lecture to supply, but to those who continued their pathological studies further they became invaluable. Perhaps he tried to make pathology too definite a science, and overlooked Moxon's warning that when we are dealing not with development on normal lines but with the abnormal influences

of a thousand and one interfering factors (all of different kinds) on that development, we cannot hope to be able to build up an orderly system any more than we can prescribe a mixture of the solar spectrum, the key of C major, and essence of peppermint, or, as he elsewhere puts it, "there is no zoology of mongrel dogs!"

Be this as it may, those who really applied themselves to the study of the subject invariably came under the spell of Greenfield's enthusiasm and of his critical attitude to the fundamental facts of his subject, and thus as has already been said, his students now occupy a large proportion of the Chairs of Pathology in English speaking universities.

The burden of all the teaching and organisation which he had to bear necessarily curtailed his leisure time, and though he continued to carry on his own research work on the kidney and other subjects and amassed large quantities of notes which he hoped to have leisure to work up after retiring from the Chair, the opportunity never came. With advancing years his health, never very robust, gave way and he suffered greatly from vertigo and from deafness which eventually became complete. He also grew almost over critical of his own work and left unpublished much that might have proved valuable in itself and as a guide to other workers, from a fear that it was not sufficiently accurate in detail. It is to be hoped that some use may yet be made of his unpublished notes and material, and that the results of so much laborious research may not be lost to science.

In this *Journal* the notice of Professor Greenfield is necessarily restricted to his medical achievements, but it would be wrong to conclude it without reference to his happy family life, to the loyalty of his friendship, and to the numerous interests—literary, scientific, and general—which filled his busy life. He was moreover a man of deep religious conviction and took an active share in all work connected with the highest welfare of the students. An intimate friend of the late Professor Henry Drummond, he was associated with him from the beginning in his work, and many others have reason to be thankful for the wise counsel and ready help which he was always ready to offer to those who sought it.

H. R.

Professor W. S. Greenfield.

CRITICAL REVIEWS.

VITAMINES.

By A. DINGWALL FORDYCE, M.D., F.R.C.P.(Edin.)

WITHIN the last ten years it has been shown that the bodily dietetic needs cannot be adequately met by a supply of protein, fat, carbohydrate, inorganic salts, and water.

In addition to these, certain other elements must be present in the food, in order to prevent the occurrence of a "deficiency disease."

These elements are known as accessory food factors or vitamines; they are at present unidentified and have not been isolated, and their presence can only be detected by experiments with animals.

So far the existence of deficiency diseases of three types has been shown, viz. :—

1. *Rickets* (and some other conditions), caused by the absence from the food of the *Fat-soluble A Growth Factor or Antirachitic Factor;*
2. *Scurvy*, due to lack of the *Antiscorbutic Factor* in the food; and
3. *Beri-beri*, due to lack of the *Water-soluble B Factor or Antineuritic Factor.*

Present knowledge goes to show that these accessory food factors cannot be produced by the animal organism and that all animals are dependent for their supply directly or indirectly upon the plant kingdom.

(It is not admitted by American observers that there is an additional or separate factor protecting from scurvy. As the result of experiments with rats they (M'Collum and his co-workers) conclude that two accessory factors are required if satisfactory growth is to be maintained—"Fat-soluble A" and "Water-soluble B." The rat is, however, insusceptible to scurvy, probably requires only a small amount of the antiscorbutic factor, and it may well be that sufficient traces of it remain in the substances of animal and plant origin which supply the other two factors. The animals used for experiment by the workers at the Lister Institute of Preventive Medicine, London, were guinea-pigs, and the results there show that an additional accessory antiscorbutic factor is required to maintain health.)

Distribution and Properties of the Accessory Factors and the Prevention of Disease.

1. *Water-soluble B Factor or Antineuritic Factor and the Prevention of Beri-beri.*

It is shown that this vitamine prevents the occurrence of beri-beri in man and analogous diseases in animals, and is also necessary to promote satisfactory growth in young animals.

It is found to some extent in almost all natural food-stuffs, but its principal sources are the seeds of plants and the eggs of animals. Yeast cells are a rich source and so also are yeast extracts.

In the case of peas, beans, and other pulses, the vitamine is distributed throughout the seed, but with cereals it is concentrated in the germ (embryo) and in the peripheral layer of the seed which in milling is peeled off with the pericarp and forms the bran.

It is stable to high temperature and acid, but is destroyed by cold.

Beri-beri is occasioned by a diet composed too exclusively of cereals from which germ and bran have been removed by milling, as in the case of polished rice or white wheat flour.

Infantile beri-beri occurs most commonly among the children of those Oriental races of whose diet highly milled rice forms the staple article.

It has been defined as "an acute or subacute disease affecting infants who are being nursed by mothers suffering from beri-beri. It is characterised by cardiac hypertrophy and a peripheral neuritis, and results in a clinical picture of generalised œdema, dyspnœa, cardiac disturbance, gastro-intestinal derangements, oliguria, and aphonia. It is a form of true beri-beri, and like the beri-beri of adults is caused by the deficiency of some important substance in the food—that is, in the milk from a mother who is suffering from a similar deficiency."

2. *The Fat-soluble A Growth Factor or Antirachitic Factor, and the Prevention and Cure of Rickets or Growth Failure in Children.*

The main sources of this factor are (1) certain fats of animal origin, and (2) green leaves.

The most notable deposits of this factor are in cream, butter, beef fat, fish oils (for example, cod-liver oil, whale oil), and egg yolk. It is present in very small or negligible amount in lard (pig fat) and in vegetable oils.

While green-leaf vegetables contain the fat-soluble factor, root vegetables are deficient in it.

The process of manufacture of margarines from whale oil involves a temperature which destroys this vitamine.

Evidence is accumulating that rickets is caused by a shortage of the fat-soluble growth factor which is only contained in certain fats. Sweetened condensed milk when suitably diluted is deficient in this vitamine as well as in fat and protein.

Milk and butter are the best sources for young and growing children; margarines made from animal fats are also valuable; those made from vegetable oils are to be condemned. Cod-liver oil and other fish oils and eggs are valuable sources of supply. When all fats are unavailable effort should be made to utilise green leaves. Ordinary cooking of green leaves occasions no serious loss of this vitamine. The juices expressed from cabbages and other green-leaf vegetables, raw or even after steaming (not immersing in boiling water) for a few minutes, might be given even to infants if all other sources of this vitamine failed.

Pregnant and nursing mothers require as liberal a supply of the factor as possible.

3. *Antiscorbutic Factor and the Prevention of Scurvy.*

This factor is found in fresh vegetable tissues and (to a much less extent) in fresh animal tissues. Its richest sources are such vegetables as cabbages, swedes, turnips, lettuces, watercress, and such fruits as lemons, oranges, raspberries, and tomatoes. Inferior in value are potatoes, carrots, French beans, scarlet runners, beetroot, mangolds, and also lime juice.

The value of fresh lemon juice as an anti-scorbutic is approximately four times that of fresh lime juice: preserved lime juice contains almost none of the factor. Milk and meat possess a definite but low anti-scorbutic value.

The vitamine suffers destruction when the fresh food-stuffs containing it are subjected to heat, drying, or other methods of preservation.

Cabbage boiled for thirty to sixty minutes loses at least 50 per cent. of its antiscorbutic power, while heating to 120° for sixty minutes entirely destroys it.

Alkalinity has a very deleterious effect on the potency of the vitamine. All dry food-stuffs are deficient in antiscorbutic properties, such are cereals, pulses, dried vegetables, and dried milk.

Tinned vegetables and tinned meat are also deficient in anti-scorbutic principle. In the case of tinned fruits, the acidity of the fruit increases the stability of the vitamine, and prevents, to some extent, the destruction which would otherwise occur during the sterilization by heat and the subsequent storage.

The extent to which the antiscorbutic factor is destroyed during cooking depends chiefly upon the time employed. When supplies are

limited, vegetables should be cooked separately and for as short a time as possible; they should not be cooked for long periods with meat in soups or stews.

If fresh vegetables or fruit are scarce or absent an antiscorbutic food can be prepared by moistening any available seeds (wheat, barley, rye, peas, beans, lentils) and allowing them to germinate. It is necessary, of course, that these should be in the natural, whole condition, not milled or split. The seeds should be soaked in water for twenty-four hours, and kept moist with access of air for one to three days, by which time they will have sprouted. This sprouted material possesses an antiscorbutic value equal to that of many fresh vegetables, and should be cooked in the ordinary way for as short a time as possible.

Preserved foods, with a few exceptions, may be regarded as devoid of the antiscorbutic principle. Lemon juice retains some value in this respect; canned tomatoes (and presumably other tinned acid fruits) have also antiscorbutic value. Canned vegetables are useless for prevention of scurvy, as also are dried vegetables.

As regards milk—cow's milk, even when raw, is not rich in the antiscorbutic vitamine; when heated, dried, or preserved, the amount contained is still further reduced. It is necessary that a large daily ration should be consumed, in fact that the diet should be composed entirely or almost entirely of fresh cow's milk, if scurvy is to be prevented by its agency alone. About half the original antiscorbutic value of fresh cow's milk is destroyed in the process of drying. Scalded milk is distinctly superior to dried milk. The most suitable antiscorbutic material to use for infants is fresh orange juice, 1 to 3 or 4 teaspoonfuls daily, according to age. The following table is given to show the distribution of the three accessory factors in the commoner food-stuffs:—

THE DISTRIBUTION OF THE THREE ACCESSORY FACTORS IN THE COMMONER FOOD-STUFFS.

Classes of Food-stuffs.	Fat-soluble A or Antirachitic Factor.	Water-soluble B or Antineuritic (Anti-Beri-beri) Factor.	Antiscorbutic Factor.
Fats and Oils.			
Butter	+++	0	...
Cream	++	0	...
Cod-liver oil	+++	0	...
Beef fat or suet	++	...	...
Pea-nut or arachis oil	+	...	...
Lard	0	...	...

Classes of Food-stuffs.	Fat-soluble A or Antirachitic Factor.	Water-soluble B or Antineuritic (Anti-Beri-beri) Factor.	Antiscorbutic Factor.
Olive oil	0	...	...
Cotton-seed oil	0	...	...
Coco-nut oil	0	...	...
Coco butter	0	...	...
Linseed oil	0	...	...
Fish oil, whale oil, herring oil, etc.	++	...	...
Hardened fats, animal or vegetable origin	0	...	...
Margarine prepared from animal fat	Value in proportion to amount of animal fat contained	...	...
Margarine from vegetable fats or lard	0	...	...
Nut butters	+	...	...
Meat, fish, etc.			
Lean meat (beef, mutton, etc.)	+	+	+
Liver	++	++	+
Kidneys	++	+	...
Heart	++	+	...
Brain	+	++	...
Sweetbreads	+	++	...
Fish, white	0	very slight, if any	...
„ fat (salmon, herring, etc.)	++	do.	...
„ roe	+	++	...
Tinned meats	?	very slight	0
Milk, Cheese, etc.			
Milk, cow's whole, raw	++	+	+
„ skim, raw	0	+	+
„ dried whole	less than ++	+	less than +
„ boiled „	undetermined	+	„
„ condensed, sweetened	+	+	„
Cheese, whole milk	+	...	...
„ skim	0	...	...
Eggs.			
Fresh	++	+++	? 0
Dried	++	+++	? 0
Cereals, Pulses, etc.			
Wheat, maize, rice, whole grain	+	+	0
„ germ	++	+++	0
„ bran	0	++	0
White wheaten flour, pure cornflour, polished rice, etc.	0	0	0

Classes of Food-stuffs.	Fat-soluble A or Antirachitic Factor.	Water-soluble B or Antineuritic (Anti-Beri-beri) Factor.	Antiscorbutic Factor.
Custard powders, egg substitutes, prepared from cereal products	0	0	0
Linseed, millet	++	++	0
Dried peas, lentils, etc.	...	++	0
Peaflour (kilned)	...	0	0
Soy beans, haricot beans	+	++	0
Germinated pulses or cereals	+	++	++
Vegetables and Fruits.			
Cabbage, fresh	++	+	+++
„ „ cooked	...	+	+
„ dried	+	+	very slight
„ canned	...	...	„
Swede, raw expressed juice	...	...	+++
Lettuce	++	+	...
Spinach (dried)	++	+	...
Carrots, fresh raw	+	+	+
„ dried	very slight	...	...
Beetroot, raw expressed juice	...	...	less than +
Potatoes, raw	+	+	...
„ cooked	...	...	+
Beans, fresh; scarlet runners, raw	...	...	++
Lemon juice, fresh	...	...	+++
„ preserved	...	...	++
Lime juice, fresh	...	...	++
„ preserved	...	...	very slight
Orange juice, fresh	...	...	+++
Raspberries	...	...	++
Apples	...	...	+
Bananas	+	+	very slight
Tomatoes (canned)	...	...	++
Nuts	+	++	...
Miscellaneous.			
Yeast, dried	...	+++	...
„ extract and autolysed	?	+++	0
Meat extract	0	0	0
Malt extract	...	+ in some specimens	...
Beer	...	0	0

From this will be noticed the valuable qualities of fresh cabbage.

It appears that when the dict of infants is or has been deficient in vitamines cabbage juice would supply all deficiencies.

The limited number of infants to whom I have recently had the opportunity of feeding this juice have taken it readily and have shown no bad effects. If the cabbage leaves are steamed over boiling water for twenty minutes the juice can be fairly readily expressed.

Infants, of course, take fresh orange juice readily and I have had no difficulty with tomato juice.

The value of green leaves in the dietary of children of 2 years and older is also obvious.

In considering the causation or treatment of disease the subject of the vitamine content of the food cannot, however, be held distinct from various other probable complicating factors.

True, cases not infrequently occur among infants in which the total daily amount of nourishment it is possible to get the child to take is very small, and in which the vitamine lack may be the determining factor (particularly when the comparatively low vitamine content of milk is borne in mind). The recent access of knowledge on the subject of vitamines is a notable advance and one which may ultimately greatly assist in the elucidation of various complicated and hitherto insoluble clinical problems not only connected with dietetic treatment but with many aspects of therapeutics and the subject of metabolism generally.

We know that such elements as vitamines exist and we are learning where they can be obtained. We, however, do not know how they act—for what reason their presence is essential to prevent disease or by what means they act in its cure.

It is impossible to accept any vitamine theory relating to health and disease which does not include consideration of the actions and activities of the various internal secretions, of the various methods of development of predisposition to bacterial infection, and also the relationship between the vitamine content and the other elements of the food.

Thus M'Carrison (*Brit. Med. Journ.*, 12th July 1919), as the result of experiments on pigeons, concludes: "1. Deprivation of accessory food factors leads in pigeons to congestive and atrophic changes in all coats of the bowel, to lesions of its neuro-muscular mechanism, to impairment of digestive and assimilative processes, and to failure of its protective resources against infection. 2. Certain gastro-intestinal disorders in the human subject—of which three examples are referred to—may owe their origin to subminimal supply of accessory food factors protracted over long periods of time."

The same observer further states (*Brit. Med. Journ.*, 16th August 1919): "The evidence so far available, both in birds and mammals, points to the dependence of the functional perfection of the adrenal glands on the adequate provision in the food of accessory food factors of all classes. It appears that lack of factors of the 'A' class (antirachitic), with excessive production of adrenalin, is associated with the occurrence of œdema in aves, and that in guinea-pigs lack of factors of the 'C' class (antiscorbutic), with diminished production of adrenalin (but

enlargement and congestion of adrenals), is associated with hæmorrhage into the body tissues."

Further, Walshe (*loc. cit.*), discussing infantile beri-beri states: "Since the antineuritic vitamine exercises its functions in association with carbohydrates, and since its absence from a dietary in which these predominate results in the profound pathological changes that we recognise as beri-beri, it is not unreasonable to suppose that in these circumstances carbohydrate metabolism may at some stage become disordered, and that this disorder results in the production of some toxic bye- or end-product which is the direct cause of beri-beri."

The field for speculation, for research, and for clinical observation is wide.

References. — *Memorandum* by the Committee on Accessory Food Factors (appointed jointly by the Medical Research Committee and the Lister Institute), "The Importance of Accessory Factors in the Food," June 1919. Chick, Hume, and Skelton, "The Antiscorbutic Value of Cow's Milk," *Bio.-Chem. Journ.*, vol. xii., Nos. 1 and 2, June 1918. Chick, Hume, Skelton, and Smith, *Lancet*, 30th November 1918, p. 735. Silva, *Lancet*, 7th September, 1918, p. 320. Campbell and Chick, *Lancet*, 23rd August 1919, p. 321. Chick, Hume, and Skelton, *Lancet*, 23rd August 1919, p. 322. Barnes and Hume, *Lancet*, 23rd August 1919, p. 323. Goadby, *Practitioner*, July 1919. Walshe, *Brit. Journ. of Child. Dis.*, October-December 1918. Drummond, *Lancet*, 1918, ii. p. 482. Vedder, *Beri-beri*, 1913, Bale, Sons & Danielsson, London.

WAR PSYCHOSES.

By D. MAXWELL ROSS, M.B., Ch.B.

It appears to be the fashion in writing of the war psychoses to point out that nothing definitely new has been revealed. Marr[1] in his preface says that "the psychoses of the war have revealed no new mental trait," and Mott[2] that the picture presented by the psychosis of a soldier differs from that presented by a civilian only in being coloured by the war experiences of the former. Lépine,[3] however, takes a different point of view when discussing this question. He finds, as he states in his preface, his notions of insanity not merely improved but modified. Each day brings to him its share of useful facts differing from those already known. It may be that, as is stated, nothing definitely new has been described, but a vast amount of material and of experience has been accumulated, and when time has allowed things to settle into their true perspective we may surely expect from all this at least some new lines of thought and observation.

It is a matter of general experience that in soldiers the most

frequently encountered mental disorders were states of confusion. Pearn,[4] writing on "Psychoses in the Expeditionary Forces," gives a table which clearly shows their preponderance in a series of cases admitted to a home hospital, and they were probably considerably more frequently encountered by those working overseas. Lépine, discussing mental confusions in his section on acute mental disorders, describes five types:—(1) Simple, (2) Hallucinatory, (3) Acute, (4) Confusion with Stupor, and (5) Amnesic Confusion. In discussing the etiology he points out a distinction between the confusions of peace time and those of war. The former have an infectious or toxic origin. An emotional element rarely plays a part in their production. In the war cases, however, emotion, a potent cause of nervous fatigue, may by its own intensity act as the determining factor. Mott, while pointing out the importance of emotional shock, usually finds in these cases a predisposing constitutional condition, an observation with which Lépine apparently agrees.

Mott, writing of the confusional states under the term "Exhaustion Psychoses," rather minimises the importance of exhaustion itself as an etiological factor and quotes a statement of Bonhoeffer's as indicating rather "that a constitutional predisposing cause is at the root of most cases diagnosed as exhaustion psychosis." This statement of Bonhoeffer's one finds it hard to accept. He says that out of 10,000 Serb prisoners of war who had been exposed to the severest exhaustion, hunger, and loss of sleep, and to all manner of infection, only five cases of psychosis developed. What one hears of the care given to prisoners by the enemy does not encourage an acceptance of such statements as this. For example, the writer had under his own care a returned officer prisoner from Bulgaria who, according to fellow prisoners, had for a long time presented mental symptoms and who had one attack of excitement so acute that four brother officers had to restrain him. Yet he was returned with no record to show that the Bulgars had at any time considered him a mental case. If this can happen with an officer prisoner, how much more may have been overlooked amongst the unfortunate Serbs.

A practical question arising out of the war has stimulated afresh the perennial problem of the etiology of general paralysis. It is now generally accepted, and Mott, Marr, and Lépine are agreed, that war conditions have rendered the onset of the disease earlier and the course more rapid in soldiers. Bonhoeffer,[5] writing in 1917, was not in entire agreement with this. He did not consider that the absolute number of cases of general paralysis had definitely increased since the war, and while the question of exacerbation of symptoms remained open his series of cases went to show that it must be rare.

Pensions Committees both in this country and in France were

disposed, looking on the disease as of syphilitic origin and therefore not influenced by service, to deal rather hardly with the general paralytic. Owing to reports presented by Lépine, Colin, and others, a conference of French psychiatrists was summoned to discuss this question. There the importance of head wounds, over-fatigue, and other war stresses, as factors in the onset and course of the disease was considered so conclusively proved that the French Government now allow, in cases where there is definite evidence of aggravation by military service, a disability of from 60 to 80 per cent., and this example has been followed by our own Pensions Committees.

All three authors discuss at some length the question of malingering, but while the simulation of organic and functional conditions is common, that of insanity itself is rare. Marr and Mott do not discuss its frequency in our own troops. Lépine found it rare amongst the French; Hoven[6] amongst the Belgians; and Agostini[7] amongst the Italians. The writer's own experience in Salonica was that it was rare in our troops there, although one must of course admit that this rarity may have been due to a failure to recognise it. The regular officer all too frequently apparently still sees a probable malingerer in every mental case and his attitude well expressed in the unkind and unjust remark, "I suppose half the men in your division (*i.e.*, the mental division) are malingering," has prevented many a man in the earlier phases of mental disorder from seeking aid owing to a dread that he would be suspected of, in his own phraseology, "swinging it."

In describing the treatment of functional cases, Mott lays emphasis on the importance of the atmosphere of cure, but while he has been most successful in his use of suggestion for the removal of obvious symptoms, he believes in careful preparation beforehand, and in equally careful treatment afterwards. He makes it a rule if he recommends discharge that some ability for occupation should be shown, and he asks the patient to obtain a letter from his former employer stating that he is willing to take him back and to give him light employment.

If one may judge by the mass of literature that has already been published there has arisen a school which believes in rapid curative treatment with little or no preparation and a rather short period of after care. Mott is evidently in agreement with that other, perhaps less dramatic, school which believes in careful and slow preparation and thorough after care. The wisdom of their methods is apparently strengthened by the experiences of the Pensions Committees, judging at any rate by the opinions of an alienist working on one of them who gave me the following results of his observations. He finds that this class of patient having been relieved of their obvious functional disabilities are discharged, often rather quickly, as cured. In con-

sequence they are allowed a low percentage of disability. This means that they must seek for employment at an early date, with the result that they are exposed to stresses they find themselves unable to meet. A relapse takes place and they have perforce to seek refuge and treatment once more, and this time, owing to a loss of self-confidence, they are probably in a more difficult state to treat than formerly.

In view of existing movements to improve our methods for dealing with mental disease in the community as a whole one of the most interesting sections in Lépine's book is his description of the Lyons Psychiatrical Centre. This for administrative purposes comprised 1020 beds. It consisted of a central administration, various annexes, and finally of some 560 beds in the Departmental Asylum of the Rhône. The administrative centre consisted of 150 beds in a large hospital, which had in addition both surgical and medical departments, an arrangement of which the advantages are obvious. New patients were all received into this department and there sorted out, a minority being kept for treatment while the others were passed on to the appropriate annexes.

The annexes included an auxiliary hospital in a converted convent which was used for the milder cases, the psychoneuroses, and slightly affected officer patients. Other annexes for certain cases of depression, shell shock, and wounds in the head, were in the country, and others were merely places for the reception of patients who required no treatment but whose discharge was under consideration. Cases whom it was necessary to intern as lunatics were sent to the Departmental Asylum. Finally, the administrative centre had an outpatient department which proved an indispensable part of the organisation.

The experience gained from the management of such a centre, embodying as it does many of the ideas it is desired to introduce into our own administration, must surely be of value if taken advantage off.

REFERENCES.—[1] Marr, *Psychoses of the War*, London, 1919. [2] Mott, *War Neuroses and Shell Shock*, London, 1919. [3] Lépine, *Mental Disorders of the War*, London, 1918. [4] Pearn, O. P. N., M.R.C.S., "Psychoses in the Expeditionary Forces," *Journ. of Mental Sci.*, April 1919. [5] Bonhoeffer, *Disabilities due to Service in the Sphere of Psycho-pathology*, Jena: Fischer, 1917. [6] Hoven, H., "Les Maladies Mentales et la Guerre," *Arch. méd. belges*, 1917, lxx. 395-405. [7] Agostini, C., "The Utilisation of Epileptics in the War Zone," *Gior. de Med. Mil.*, 1918, lxvii. 24-33.

NEW BOOKS.

Text-Book of Physiology. By MARTIN FLACK and LEONARD HILL. Pp. vi + 800. London: Edward Arnold. 1919. Price 25s. net.

THIS volume seems to us likely to take an important place among the numerous text-books on physiology. It is arranged in thirteen sections, the first of which deals with general physiology, opening with a biological introduction, followed by chapters on the cell, the chemistry of the body, and on enzymes.

Book II. deals with the blood and contains a useful chapter on hæmolysis and immunity. The circulation and metabolism are adequately dealt with. The chapter on the mechanism of respiration is disappointing. It contains little more than some anatomical details, and a practitioner of medicine who wishes to look up the physiological principles which may help him to understand the problems offered by diseases of the pleura and lungs will look in vain. The remaining sections deal adequately with excretion, motion, the nervous system, and reproduction.

We confess to some astonishment that so good a book by such distinguished authors should contain many minor blemishes.

On page 98 we read that "morbid conditions which cause large numbers of basophils to appear in the blood are extremely serious, and for this reason they have been termed the *the harbingers of death.*" We know of only one morbid condition—myeloid leukæmia—in which large numbers of basophils appear with any constancy, and in that disease prognosis has no relationship to the number of basophils.

On page 211 we read that from a wounded artery the blood spurts in pulses, from a wounded vein it flows continuously. This will certainly give a junior student a wrong impression. The flow of blood from an artery is not interrupted between the pulse waves. On page 313 there is a gem of fine writing—"he who is inside, and helps to make the 'fugg,' is wholly unaware of the same and unaffected by it." "To respirate children artificially it is best to put mouth to mouth (interposing a handkerchief) and rhythmically blow up the lungs" (page 324) is sorry English and bad advice.

On pages 743, 744 we are told that in using the chest or normal register, the chink is narrow and long, in using the head register the chink is wider. The student is left wondering what a register is and where to find two of them between the scalp and the diaphragm. On page 760 we are told of an explanation "which to many has *appeared apparent*"!

This by no means exhausts the evidence of a lack of revision, and we refer to the matter because we think the book merited more care than it has received in the details of its presentment. The illustrations are numerous and excellent.

Fats and Fatty Degeneration. Dr. MARTIN H. FISCHER and Dr. MARIAN O. HOOKER. Pp. 155. With 65 Illustrations. London: Chapman & Hall. 1917. Price 9s. 6d. net.

THIS book, to quote the authors' own words, represents "an attempt to analyse colloid-chemically the third phase in the reaction of living matter to injury," the three phases being swelling, clouding (*i.e.* dehydration with consequent precipitation of certain tissue colloids), and "fatty degeneration." The changes of the first two phases are reversible, and the damaged tissues may therefore recover their function. The changes induced in the third stage are, in the main, irreversible, and may even advance to a fourth stage of "necrosis."

The chief value of the book, from the point of view of practical biochemistry, is that it replaces by definite laws much of what was empirical in the production and maintenance and destruction of emulsions, and so establishes fundamental principles which will guide the chemist and the physician in their respective spheres, and at least aid the latter in the prevention, if not the cure, of many grievous diseases. Whether one agrees with all that the authors set forth or not, the book is most stimulating, and is well worthy of perusal by students of scientific medicine and pathology.

Surgical Treatment. By JAMES PETER WARBASSE, M.D., New York. Vol. I. Pp. 947. With 699 Illustrations. Philadelphia and London: W. B. Saunders Company. 1918.

THIS is the first volume of a practical treatise on the therapy of surgical diseases for the use of practitioners and students of surgery. When the work is completed by the issue of the other two volumes promised, it will form a most comprehensive exposition of the subject. This, indeed, was the author's intention; his object, he tells us, has been "to place in the hands of the surgeon the means for rendering help in every surgical condition under all circumstances." So far as this volume enables us to judge, he has succeeded—if indeed any book can make the surgeon quite so universally useful.

The volume before us deals with the subjects that are usually included under the term "general surgery"—technique, anæsthesia, wounds, inflammations, diseases of blood vessels, bones, joints, etc., and fractures.

We find ourselves in general agreement with the author in his estimate of different methods of treatment; and it is evident that he has made his choice from actual practical experience and observation. He writes in a clear, precise, and even dogmatic style, which accords with the purpose of the work. One ambiguous statement, however, has caught our eye, in the advice given regarding the torsion of blood vessels to arrest bleeding—"a rule is to twist the vessels, the names of which are not known to the surgeon" (p. 341).

The illustrations are both numerous and good, and there is an excellent index. We can confidently recommend this work of reference.

The Elementary Nervous System. By G. H. PARKER. Pp. viii. + 229. With 53 Illustrations. Philadelphia and London: J. B. Lippincott Company. 1919. Price 2.50 dollars net.

THIS is an illuminating account of the elementary nervous system as found in the simpler animals, especially in Cœlenterates, many of the recent advances in our knowledge of which are due to the ingenious experiments of the author. Prof. Parker shows that muscle is the primitive element in the evolution of the neuro-muscular mechanism, for physiological findings agree with histological observations in supporting the conclusion that sponges have oscular and pore sphincters, but no nervous elements. The next step in evolution is represented by the receptor-effector system of the Cœlenterates. Here, in addition to the effector, is a receptive element—a modified epithelial cell,—the basal processes of which are applied to the subjacent muscle-cells, and the quicker response is evidence of the increased efficiency of this new system, although the nervous activities of the animal are quite uncentralised. The basal branches of the receptor cells not only are applied to the muscle-cells, but form among themselves a network of communication whereby the impulse from one receptor may be transmitted to many muscle-cells. In this nerve-net cells appear, and thus arise the primitive units of the nerve-net, termed by Prof. Parker "protoneurones," which in the course of evolution have become, in the Annelids and higher groups, differentiated to the condition of definite neurones related through synapses. Prof. Parker deals in a specially interesting manner with the subject of nerve-nets in the vertebrate heart and small intestine. Appended to the work is a useful list of the more important literature of the subject, including the titles of a number of papers published in 1917 and 1918.

Animal Parasites and Human Disease. By Asa C. Chandler. Pp. xiii. + 570. With 254 Illustrations. New York: John Wiley & Sons; London: Chapman & Hall. 1918. Price 21s. net.

The author states that his book is not intended to serve as a systematic work of reference for the parasitologist. His aim has been to present the important facts regarding animal parasites in relation to human disease in such a manner as to make the book helpful to public health and immigration officers and other medical men, to teachers of hygiene and students, and to others who are interested in the progress of science and civilisation. It may be said at once that the author has succeeded in giving a clear and interesting exposition in which due attention has been devoted to the recent advances in our knowledge. For instance, his chapter on Spirochætes includes accounts of relapsing fever, syphilis, yaws, infective jaundice (Weil's disease), rat-bite fever, and other spirochæte diseases. The author states the chief characteristics of the more important protozoa, worms, insects, ticks, and mites, associated with disease in man; gives a clear outline of their life-histories; and considers their effects on their respective hosts and the principal methods of prevention, destruction, and treatment.

The illustrations are excellently chosen, many of them from recent papers, and several useful comparative figures are given, *e.g.* of a ripe segment of various species of human tape-worms. The figure of measly pork is, however, poor; the figure of *Entamœba histolytica* shows a non-existent contractile vacuole, and the bristles are not correctly shown in the figure of the head of *Pulex irritans.*

Some few statements in the text are perhaps a little too positive—*e.g.* that the germ of yellow fever is "almost beyond question" a protozoon,—and there are a few slips such as Aucheromyia for Auchmeromyia; but the defects noted are all small matters.

The book can be cordially recommended as a clear and straightforward presentation of the important facts of the subject, burdened as little as possible with minutiæ of structure and details of classification.

A Treatise on Regional Surgery. By Various Authors. Edited by John Fairbairn Binnie, Kansas City, Missouri. Three Volumes. Pp. xx. + 2138. With 1985 Illustrations. London: H. K. Lewis & Co., Ltd. 1917. Price 32s. net. each volume.

This work, which we have just received, is intended to present the senior student and the practitioner with an exposition of the application of general surgical principles to the various lesions of the different regions of the body. The plan has been to allocate each region to a writer of authority on the subject, and give him a free

hand, with certain limitations of space, in dealing with it, preferably by expressing his personal views and experience. Here the Editor's functions seem to have ceased, for he tells us in the preface that he "has not presumed to interfere in the slightest degree with the material contained in the various chapters." Thus he transfers to the contributors, of whom he himself is one, the whole responsibility for the standard of the work.

We cannot wholly approve this method of editing an important treatise. The function of an editor is to edit, and there are places where the judicious use of the blue pencil would have improved the work before us. A uniform method of giving references to original sources also might have been adopted; some are given in the text, others as footnotes, and still others at the end of the section; and some system might have been followed in providing legends to the illustrations. Nor are we satisfied when we are told that "there was so much difficulty in securing a suitable authority to write a chapter on the diseases of the brain that, rather than insult the reader with a piece of 'hack work,' the Editor chose to omit it entirely"!

It must be admitted that the selection of his collaborators has been carefully and successfully carried out. Most are American, but a few representatives of British and Australian surgery make contributions. The personal note is clear and distinct throughout most of the sections, and this certainly adds to the interest and value of the work.

It is impossible to refer to the different essays in detail, and to make selections would be invidious; suffice it to say that, within the limits set, we have here a representative and authoritative presentment of the present-day aspects of practical surgery.

The illustrations are unequal in merit and execution, but they are well designed to elucidate the text.

NOTES ON BOOKS.

We have received from MM. Masson & Cie a useful little work, *Le Français*, by M. Dessagnes, Professor of English at the Lycée Louis-le-Grand, Paris. It is a simple course of instruction in the French language on the intuitive and direct method. Beginning with the simplest terms—that is, the names of objects which can either be shown or represented by drawings,—sentences becoming more and more elaborate are introduced, so that the student gradually acquires not only a vocabulary, but also an acquaintance with grammar and syntax. As all new terms are explained with the help of those already learned, constant appeal is made to the memory, so that notions already acquired are not forgotten. An interesting and effective method of teaching the French language.

New editions of Caird and Cathcart's *Surgical Handbook* (Chas. Griffin & Co., Ltd., price 8s. 6d.) come with such unfailing regularity that it is difficult to keep pace with them. This issue (the eighteenth edition) contains a note on antiseptics in time of war, which is new.

BOOKS RECEIVED.

BAINBRIDGE, F. A., and J. ACKWORTH MENZIES. Essentials of Physiology. Third Edition (*Longmans, Green & Co.*) 12s. 6d.

BESREDKA, A. Anaphylaxis and Anti-Anaphylaxis. (*Wm. Heinemann (Medical Books), Ltd.*) 6s.

BROWNING, C. H., and DAVID WATSON. Venereal Diseases (*Henry Frowde and Hodder & Stoughton*) 16s.

BUCHANAN, A. M. Manual of Anatomy. Fourth Edition (*Baillière, Tindall & Cox*) 30s.

COLYER, J. F. Dental Surgery and Pathology. Fourth Edition (*Longmans, Green & Co.*) 32s.

DAVIES, H. MORRISTON. Surgery of the Lung and Pleura . . . . (*Shaw & Sons*) 25s.

FREEMAN, ROWLAND GODFREY. Elements of Pediatrics . . (*Macmillan & Co., Ltd.*) 10s. 6d.

GRUNER, O. C. The Exact Diagnosis of Latent Cancer . (*H. K. Lewis & Co., Ltd.*) 7s. 6d.

HARMAN, N. BISHOP. Aids to Ophthalmology. Sixth Edition (*Baillière, Tindall & Cox*) 3s. 6d.

HIRST, BARTON COOKE. Atlas of Operative Gynecology . . (*J. B. Lippincott Co.*) 30s.

KEITH, ARTHUR. Menders of the Maimed . (*Henry Frowde and Hodder & Stoughton*) 16s.

LUMB, N. P. L. The Urethroscope in the Diagnosis and Treatment of Urethritis (*John Bale, Sons & Danielsson*) 10s. 6d.

M'DONALD, ARCHIBALD L. Essentials of Surgery . . . (*J. B. Lippincott Co.*) 8s. 6d.

MACKENZIE, Sir JAMES. The Future of Medicine (*Henry Frowde and Hodder & Stoughton*) 8s. 6d.

MAGIAN, A. C. The Practitioner's Manual of Venereal Diseases (*Wm. Heinemann (Medical Books), Ltd.*) 10s. 6d.

MAGILL, E. M. Notes on Galvanism and Faradism. Second Edition (*H. K. Lewis & Co., Ltd.*) 6s.

MEDICAL ANNUAL for 1919 . . . . . (*John Wright & Sons, Ltd.*) 20s.

MENZIES, K. Autoerotic Phenomena in Adolescence . . (*H. K. Lewis & Co., Ltd.*) 4s. 6d.

MORGAN, C. LLOYD. Eugenics and Environment . (*John Bale, Sons & Danielsson*) 2s.

NEIL, J. HARDIE. Field Ambulance Organisation and Administration (*H. K. Lewis & Co., Ltd.*) 4s. 6d.

PEARSON, M. G., and J. DRUMMOND. Fractured Femurs (*Henry Frowde and Hodder & Stoughton*) 10s. 6d.

PERRETT, WILFRID. Some Questions of Phonetic Theory . . . (*W. Heffer & Sons*) 2s.

PRENDERVILLE, A. DE. Anæsthesia and the Nurse's Duties (*Wm. Heinemann (Medical Books), Ltd.*) 3s. 6d.

QUÉNU, E. La Toxémie Traumatique . . . . . (*Librairie Félix Alcan*) frs. 6.60

REES, FERDINAND. National Health . . . . . (*John Wright & Sons, Ltd.*) 1s. 6d.

SIMON, CHARLES E. Human Infection Carriers . . . . . (*Lea & Febiger*) $2.25

SMITH, G. ELLIOT, and T. H. PEAR. Shell Shock and its Lessons (*Longmans, Green & Co.*) 1s. 6d.

SOLOMONS, BETHEL. A Handbook of Gynæcology . . (*Baillière, Tindall & Cox*) 10s. 6d.

TRANSACTIONS of the American Gynecological Society. Vol. XLIII. 1918 (*Wm. J. Dornan*) —

VISCHER, A. L. Barbed Wire Disease . . . (*John Bale, Sons & Danielsson, Ltd.*) —

WILSON, JAMES C., N. B. POTTER, and NORBERT ORTNER. Internal Medicine. In Three Volumes. Fifth Edition . . . . . (*J. B. Lippincott Co.*) 75s.

EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

The late Mr. Skene Keith.

On the 19th of September Mr. Skene Keith died, after a week's illness, of pneumonia contracted in the course of his work.

Mr. Keith was a quiet, modest, and unobtrusive man who, if not much in the public ken, had achieved great success as an operating gynecologist. His death, coming so soon after that of his brother George, who succumbed to the same malady last December while on active service at Bordighera, was a great loss to the profession as well as to the many friends who knew and loved him. Both brothers had inherited the diagnostic acumen and manual dexterity of their illustrious father, the late Dr. Thomas Keith, one of the pioneers in ovariotomy. It was an inspiring sight to watch the brothers working together at an operation.

It is many years ago that Mr. Skene Keith published his first hundred cases of ovariotomy with a mortality of rather less than 3 per cent., and his success grew as time went on.

He went to London while still a young man, and was appointed on the staff of the Samaritan Hospital, but he resigned his post and returned to Edinburgh to assist his father, and was appointed Special Assistant Surgeon for Ovarian Diseases to the Royal Infirmary, Edinburgh.

Ultimately both father and son went to London and practised there.

Mr. Keith published an excellent treatise on "Gynæcological Operations" and another on "Abdominal Surgery" in collaboration with his brother, Dr. George E. Keith.

Royal College of Surgeons of Edinburgh.

At the meeting of the Royal College of Surgeons of Edinburgh held on 15th October, Dr. George Mackay was appointed President, Dr. R. M'Kenzie Johnston, Vice-President, and Mr. Alexander Miles, Secretary and Treasurer.

At a meeting of the College held on 15th October, the following gentlemen having passed the requisite examinations were admitted Fellows :—

David Aiken, M.B., Ch.B.(Edin.), Capt. A.A.M.C.; George Herbert Alabaster, M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.B., Ch.B., M.D.(Birm.), Capt. R.A.M.C.; Robert Marshall Allan, M.B., Ch.B., M.D.(Edin.), Capt. A.A.M.C.; John Anderson, M.B., Ch.B.(Aberd.); Ralph Campbell Lindsay Batchelor, M.B., Ch.B.(Edin.), Capt. R.A.M.C.; William George Bendle, M.B., B.S.(Durh.); Herbert Alfred Bodkin, M.R.C.S.(Eng.), L.R.C.P.(Lond.); Theodore Chalmers, M.B., Ch.B.(Aberd.); Louis David Cohen, M.R.C.S.(Eng.), L.R.C.P.(Lond.); James Reid Dick, B.A.(Cantab.), M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.B., Ch.B.(Cantab.); Louis Daniel Englerth, M.D.(Jefferson Medical College, U.S.A.); William Dawson Galloway, B.A.(Cantab.), M.R.C.S.(Eng.), L.R.C.P.(Lond.); Howard Vivian Alexander Gatchell, L.R.C.S.E.(Triple), D.P.H., Major R.A.M.C.(T.F.); John Guthrie, M.B., Ch.B.(Glasg.); Howard Havelock Hepburn, M.D., C.M.(Univ. M'Gill), L.M. & S., C.P. & S.(Alberta), Temp. Capt. R.A.M.C.; Pow-Kan Liang, M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.A., B.Ch.(Cantab.); Keith Shelly Parker, M.B., Ch.M.(Sydney), Major A.A.M.C.; William James Porteous, M.B., Ch.B., M.D.(Edin.), Capt. N.Z.M.C.; John Joseph Power, M.B., Ch.M.(Sydney); Robert Vachell de Acton Redwood, M.R.C.S.(Eng.), L.R.C.P.(Lond.); Andrew Stewart, M.B., Ch.B.(Glasg.), Temp. Lieut.-Col. R.A.M.C.; John Arthur West, M.R.C.S.(Eng.), L.R.C.P.(Lond.); Ernest Gotshall Williamson, M.D.(Jefferson Medical College, U.S.A.); Douglas Wood, M.B., Ch.B., M.D.(Aberd.), Capt. A.A.M.C.

Triple Qualification Passes.

At the examination of the Board of the Royal College of Physicians of Edinburgh, Royal College of Surgeons of Edinburgh, and Royal Faculty of Physicians and Surgeons of Glasgow, held in October, the following candidates passed the *First Examination*:—David R. Paterson, Patel S. H. Masters, James M. Crombie, Orry S. Crowthers, and James A. M. S. Evers.

The following passed the *Second Examination*:—John J. L. M'Donald, Raymond Levey, Sidney Sack, Peter J. B. Dyce, Robert E. O'Keeffe, William Gray, Herbert J. Appleyard, and Ian B. Cummings.

The following passed the *Third Examination*:—Francis X. Hayes, Arthur R. Lambie, Herbert Brown, William W. Glucksman, Ronald G. Clouston, Muriel Keyes, Helen Worthington, John P. Crichton, and Joseph Black.

The following candidates, having passed the *Final Examination*, were admitted L.R.C.P.E., L.R.C.S.E., L.R.F.P. & S.G.:—John Bruce Watson Telford, Leith; Henry Jennings, Liverpool; Michel Sidawi, Beaucourt; Thomas Ferguson Minford, Templepatrick; Thomas Robertson Sinclair, Kirkcaldy; Iain Ross Macphail, Derby; John Alfred Alexander Duncan, Middlesbrough; George Coote Field, Pinetown, Natal; John Thomas Dier, Dublin; John Richard Larson, Persia; Lewis Rifkind, Russia; Mandayam A. P. Iyengar, Madras; William Gibson Wilson, Glasgow; Gordon Beveridge, Scotland; Norman Joseph Patterson, Ireland; Gilbert Llewellyn Stanley, Clifton, Somerset; Alan Herbert Brooke Hudson, Sheffield; and Daniel Augustine Dias, Carlisle.

Dental Passes.

THE following candidates passed the *Final Examination* and were granted the Diploma L.D.S., R.C.S. (Edin.):—Ralph Lawson Keith Common, Stirling; Edgar Gordon Adams, Leeds; Herbert Daniel Howard, The Hague, Holland; Alexander Miller, Caithness; Bene Rippen, Nieurve, Pekela, Holland.

The following candidates, having passed the First and Second Examinations *in Public Health*, were admitted Diplomates in Public Health:—Crichton R. Merrillees, L.R.C.S.E.(Triple); Charles M. G. Elliott, L.R.C.S.E.(Triple); Peter M. Tolmie, L.R.C.S.E.(Triple); Martha L. Hamilton, M.B., Ch.B.; Robert J. M. Horne, M.B., Ch.B.; Robert N. M'Kinstry, M.B., Ch.B.; Thomas B. Gilchrist, M.D.; James J. Galbraith, Ch.B., M.D.; John E. Allan, M.B., Ch.B.; Robert C. Robertson, M.B., Ch.B.; William A. Lethem, M.B., Ch.B.; Annie M. Madin, M.B., Ch.B.

AN INAUGURAL LECTURE IN THE MONCRIEFF ARNOT CHAIR OF CLINICAL MEDICINE.

By FRANCIS D. BOYD, C.B., C.M.G., M.D.

The Moncrieff Arnot Chair of Clinical Medicine was founded under the bequest of James Moncrieff Arnot of Chapel. Born in 1794, he was educated at the High School and the University of Edinburgh, taking his M.D. in 1813, and subsequently studied in London, Vienna, and Paris. Practising surgery in London, he was one of the founders of the Medical School of Middlesex Hospital, and for many years was surgeon there and at the "North London." He afterwards occupied the Chairs of Surgery at King's and University Colleges. One of the original Fellows of the Royal College of Surgeons, he was twice President and represented the College on the Medical Council. On succeeding to the estate of Chapel he retired from practice and lived to the ripe age of ninety-one. He was, it is said, "in every sense of the word a truly great man, conscious of his abilities to assume the highest responsibilities of his profession and most conscientiously discharging these duties."

In the inaugural lecture in the Chair of Clinical Medicine it seemed suitable to discuss the teaching of clinical medicine in Edinburgh in the past and the present.

The history of the teaching of clinical medicine has been of necessity intimately linked with the history of the Royal Infirmary, and its association with the "Touns College" and the Royal College of Physicians. The Royal College of Physicians owes its origin to a "small galaxy of accomplished, energetic and some of them rather eccentric physicians" who having been trained in foreign schools were congregated in Edinburgh. Their chief and leader was Sir John Sibbald, an accomplished scholar and sagacious man of affairs. After several efforts, and against considerable opposition from powerful interests, a Royal Charter was granted to the College and the Great Seal appended on St. Andrew's Day, 1681.

The sick poor of the city seem early to have been taken under the care of the College, for on 10th February 1682 the College appointed two of its number to serve the poor of the city and suburbs. The disadvantage of treating the sick poor in their own homes, such as they were at that time and distributed over the

city and suburbs, became soon appreciated, for we find from the minutes of the College in 1725 that the plan of an infirmary was suggested by the College to several well-disposed persons and a public meeting was called to carry the idea into effect. The president reported to the College that according to their desire he and several of the members had set on foot a subscription for erecting and maintaining an infirmary or hospital for the sick poor and "had had pretty good success." On 1st August 1727 the Royal College bound itself by a minute that "one or more of its members shall attend the said Hospital faithfully and freely, without any prospect of reward or salary, until the stock of the said Hospital shall be so increased that it can afford a reasonable allowance for one or two physicians." The stock has not yet reached the desired level. On 5th August 1729 the minutes of the College show that a temporary hospital was established in which the sick poor were attended by its Fellows. The temporary hospital was a "small hired house" which contained four beds for the accommodation of the sick.

If Edinburgh was fortunate in its physicians in the early part of the eighteenth century it was still more fortunate in its Chief Magistrate. It is difficult to adequately estimate what Edinburgh owes to George Drummond, to his wide and statesmanlike outlook, and to his devotion to his native town as the capital of Scotland. The Royal Exchange, the City Chambers, the Courts of Justice all speak to his memory. During his long term of office as Chief Magistrate a petition to Parliament was presented for the extension of the royalty of the town both to the north and to the south, with a view to building the North and South Bridges, and the formation of the New Town and the addition of new streets and squares to the south. Drummond lived at a critical time, when Edinburgh might have rapidly sunk to the status of a small provincial town. Of the many schemes in which Drummond was interested there was none which could rival his devotion to the Infirmary. After some years of trial the value of the temporary hospital was recognised and the Managers presented a petition to His Majesty, who was graciously pleased to grant a charter, dated 25th August 1736, under the name of the Royal Infirmary. The scheme was an ambitious one when we consider the times and the disturbed condition of the country. The plan proposed to accommodate 228 sick people with all the necessary offices, and there was a theatre where "more than 200 students can see operations, and which is also a convenient

Chapel." I doubt if my surgical colleagues would recognise any connection between a mortuary chapel and a surgical theatre or would now approve of the arrangement.

When the order for building the house was given to the Managers, they made application for charitable assistance where they had any view of obtaining it, and they were supplied "far beyond their hope." The Venerable Assembly of the Church of Scotland ordered collections at the church doors, the Reverend Episcopal clergy were moved by no less zeal for the good work, the Managers of the Assembly gave benefit nights, most societies in and around Edinburgh and several other parts of Scotland sent money. Gentlemen and merchants made presents of timber, stone, lime, slate, and other materials; farmers and carters supplied carriages, mechanics and labourers gave days' work gratis, and people of all ranks assisted the Managers to proceed in the building. Under Drummond and the first Munro as building committee the work proceeded rapidly, but as the people of Scotland were too poor to be able to spare as much money from their ordinary expenses as was necessary for finishing the house in a short time, the Managers dispersed copies of their plans to England, Ireland, and the British Plantations, from all of which countries considerable remittances were made. So the Infirmary progressed, but the times were troublous, and in 1745–1746 the affairs of the Infirmary, as well as those of the whole country, were in confusion through the Rebellion, and the "house became a general hospital for sick and wounded soldiers whom the Managers assisted in every way they could"; "since which time sick soldiers from Flanders have been accommodated." History has a way of repeating itself, and in the immediate past sick soldiers from Flanders have again been accommodated in the wards of the Royal Infirmary.

An excellent bust of George Drummond, executed by Nollekens in 1772, stands to-day in the main corridor of the Infirmary. The student of to-day as he passes may note that to "George Drummond his country is indebted for all the benefits it derives from the Royal Infirmary."

At the time the Infirmary was founded the Town Council had appointed four Professors in the Medical Faculty who delivered lectures on chemical pharmacy, practice of physic, and the institutes of the theory of medicine. From the Laws of the Infirmary, published in 1749, it appears that "the Professors of Medicine in the University may during their attendance give clinical lectures to the licensed students on the cases of the

patients of the Infirmary, at any hour excepting the ordinary time of visiting, and may have the perusal of the ledger of patients."

The practice of giving bedside instruction in the public hospitals of Europe appears to have been initiated in Italy in the schools of Padua and Pavia about the middle of the 16th century, but it seems after a time to have been suspended. Before the middle of the 17th century, however, clinical lectures had been introduced into the medical schools of Holland by Stratten of Utrecht and Otto Heurnius of Leyden, who was succeeded by Sylvius de le Boe. In the same school in the 18th century the method of clinical instruction was pursued by the illustrious Boerhaave, by whose pupil Rutherford it was introduced into Edinburgh in 1748. John Rutherford, Professor of the Practice of Physic in the University, feeling the need of illustrating practically at the bedside the principles which he expounded in his systematic lectures within the University, obtained from the Managers permission to give a course of clinical instruction in the Royal Infirmary. He inaugurated a new era and laid the foundation of the clinical teaching of medicine in Edinburgh. The notes of his lectures have come down to us in manuscript. In them there is, to us, much that is quaint and the terminology is a study in itself, but they stand for the first effort at practical clinical teaching in Edinburgh. Dr. Rutherford's portrait graces the walls of the Royal College of Physicians.

Of the early teachers of clinical medicine in Edinburgh there is one William Cullen whose name has descended to us as a splendid tradition. Passing from Glasgow to the Chair of Chemistry in Edinburgh University, he rapidly became the popular clinical teacher in the Royal Infirmary. Cullen possessed in a remarkable degree the qualifications necessary for a clinical teacher. To an extensive knowledge of the ancillary branches of medicine, he added in the highest degree the gift of accurate clinical observation and description of disease, and the power of clear and interesting exposition. An enthusiast himself, he had the happy knack of inspiring enthusiasm in others. Lecturing from notes alone, his style was easy and attractive, but the notes show how carefully his lectures were thought out. As a teacher he acquired immense popularity and his clinic drew students from many parts of the Continent. At the time when Cullen took up the teaching of clinical medicine, the theory and practice of medicine was largely influenced by the system of Boerhaave, and

there were few who claimed to be scientific and philosophic physicians, who had not studied under Boerhaave, and his system commanded the schools. The mechanical doctrine of simple solid and the humeral pathology as modified by Boerhaave continued for many years the foundation of medical teaching and writing. The spirit of experimental physiological research, which was introduced by Haller, was in its infancy, and medical teaching was governed by philosophic reasoning and not by scientific experiment. The credit of having perceived and pointed out more clearly than any other the powerful influence of the nervous system in regulating animal economy, and more particularly in his application of this doctrine to the explanation of disease, belongs to Hoffman. His views supplanted the doctrines which had persisted for two thousand years. Cullen accepted Hoffman's views, applying them and modifying them as his experience widened. Cullen's teaching, in that it departed from the generally accepted views of Boerhaave, gave rise to much criticism from his contemporaries. So bitter was this at one time that his friend Provost Drummond begged him to modify his views, but Cullen, conscious of his earnestness and truth, refused to bow to the storm. Cullen recognised that progress in knowledge for the physician can only be obtained by verifying the diagnoses after death, and that much, possibly more, may be learned from error in diagnosis than from success. This principle he carried into his teaching. In 1772 we find him telling his students: "It is not improperly said that the earth hides the faults of the physician. If every patient that dies were opened as ours has been, it would but too often discover the frivolity of one's conjectures and practice. In these lectures, however, I hazard my credit for your instruction —my first views, my conjectures, my projects, my trials—in short, my thoughts, which I may correct and if necessary change; and whenever you yourselves shall be above mistakes, or can find anyone who is, I shall allow you to rate me as a very inferior person. In the meantime, I think I am no more liable to mistakes than my neighbours, and therefore I shall go on telling you of them when they occur." In 1763 Alston, the Professor of Materia Medica, died, and Cullen, who had previously lectured on materia medica in Glasgow, took on the duties at a few days' notice, and met with great success. It is interesting to note that in his teaching he never gave way to one of the vices of the age—polypharmacy. "There is nothing" he observes in one of his lectures, "I desire so much, as that any disease we treat here should be a

matter of experience to you; so you must not be surprised that I use only one remedy when I might employ two or three; for in using a multiplicity of remedies, when a cure does succeed, it is not easy to perceive which is most effectual; but I wish that you may always have some opportunity of judging with regard to their proper effects." This is a saying that many a modern physician might well take to heart. Cullen was an indefatigable worker; his different publications were translated into French, German, Italian, and even Latin. As a man Cullen appears to have possessed a charming personality, and to have had a wonderful power of inspiring the love and reverence of his students and younger colleagues. He died in 1790. His bust by Gowans is in the University Library. The care of his grave is a charge on the Royal College of Physicians, and every second year the Council of the College make a reverential pilgrimage to the tomb.

Judged by present standards the early teaching of clinical medicine was somewhat "crude." The clerk read aloud, at certain and specified times, the reports of the cases, while the teacher dictated to the clerk his view of the case, with comments and prescriptions. But crude as it may have been, the teaching met with success, for within two years the number of students had so increased that the Managers of the Infirmary appropriated a special ward to be used exclusively by Professor Rutherford. Yet one must admit that even by 1829 it met with severe criticism by one of its distinguished students, Dr. Graves of Dublin. Edinburgh he selects as by "far the most celebrated of the British Schools of Physic, and much resorted to even by foreigners for instruction." The clinics seem to have been crowded. "At his daily visit the physician stops at the bed of each patient, and having received the necessary information from the clerk, he examines the patient, interrogating him in a loud voice, while the clerk repeats the patient's answer in a tone of voice equally loud. This is done to enable the whole audience to understand what is going on; but indeed when the crowd of students is considerable this is no easy task; it requires an exertion almost stentorian to render the conversation between the physician and his patient audible by the more distant members of the class: while the impossibility of seeing the patient obliges all who are not in his immediate vicinity to trust solely to their ears for information." In the light of this account one can understand the regulation in the original rules of the Royal Infirmary that students were prohibited from standing on

the beds. One must agree with Stokes that such a method of teaching could not produce self-reliant physicians.

Edinburgh and the Edinburgh Medical School owe a deep debt of gratitude to John Hughes Bennet, Professor of the Institutes of Medicine and of Clinical Medicine from 1848 to 1874. He may be regarded as the founder of our present method of teaching. After graduating in Edinburgh in 1837, he proceeded to Paris, where he studied for two years, and afterwards for two further years in the universities of Germany. Returning to Edinburgh with ideas widened by Continental study, he devoted much time to demonstrating the value of the microscope in its bearing on physiological, pathological, and clinical work. Appointed Physician to the Royal Dispensary, he at once showed his devotion to clinical teaching, forming his classes on the model of the Continental polyclinic in which students were taught practically, under the eye of their teacher, to examine and prescribe for patients. Appointed Professor of the Institutes of Medicine in 1848, he became likewise Professor of Clinical Medicine. As a clinical teacher he appears to have been unrivalled in his time. His lectures are described as a "work of art on which he spared no pains," but at the bedside he was at his best. As a clinical teacher the leading idea in his mind seems to have been to teach the student *method*. He had a special talent for extemporary speaking and appeared to greatest advantage when, laying aside his manuscript, he proceeded to attack the position of an adversary; and as he was a man of strongly pronounced opinions of his own, this was no uncommon occurrence. He was a man of incessant mental activity—an indefatigable worker. His clinical lectures, which passed through five editions, were translated into French, Russian, and Hindoo. Bennet died in 1875, leaving behind him a record of work which has seldom been equalled.

An epoch in the clinical teaching in Edinburgh came when the present Royal Infirmary was opened. For a considerable time it had been recognised that the old buildings were quite inadequate for the treatment of the patients, and the progress of the school in clinical teaching. It was a fortunate decision which the Managers made to erect a new hospital on the present site, rather than to rebuild the old institution as was at one time proposed. Our present hospital was erected in nine years and was at the time of its completion claimed to be the largest and most up-to-date hospital in the kingdom. The

Board of Management must have had an anxious time when it was discovered mid-way in the building operations that the building was to cost two and a half times the estimated amount. The then chief magistrate, Mr. Boyd, who like Provost Drummond was deeply interested in the scheme, assured the Board that they might rely on the public coming forward to relieve them of their difficulties. Mr. Boyd's assurances were amply fulfilled, and the New Royal Infirmary was duly opened on 29th September 1879. Since then, many additions and improvements have been made in the buildings and equipment of the hospital to add to its efficiency in the treatment of the sick and suffering and the clinical instruction of the student. But while much has been done, much remains to do at the present day to keep our Royal Infirmary in the position it should hold as the hospital in a leading teaching school. We, the teachers, are willing to do all we can in teaching and research to try and maintain the traditions of a great past, but we want help from the generous public. We want new departments, new laboratories, the endowment of research.

We want clinical laboratories in connection with the wards. I am not one who can be accused of pushing the laboratory side in the education of the student, at the expense of the bed side teaching, but one would wish to see the scientific chemist linked up with the clinician. One looks forward to the time when, with advantage alike to the patient and the student, our Professor of Medical Chemistry will be our intimate colleague to advise us on the chemical problems which daily confront us in the wards. It is only by the intimate co-operation of scientist and clinician that progress will result. We want a new radiographical department where the student can study his anatomy in the living body, and make it of vital, human interest; where he can view the pulsation of the heart, the expansion of the lungs, the movements of the diaphragm, the mechanical factors in digestion, and the many physiological and pathological phenomena which radiography can show. We want a fully equipped balneological department. Is there any department of therapeutics which is more open to abuse than the Spa treatment of disease? Possibly not, but surely that is the more reason why we should give the student an efficient education on the subject on rational and scientific lines. We want an efficient department for the physical treatment of disease. Those of us who have had the fortune to serve with the army at home and abroad, know what can be done in the physical treatment of cardiac and nervous conditions, and would value such a depart-

ment in our Infirmary. Can we trust the public will come forward as in the past and help us?

In former days a single teacher conducted clinical instruction for three months, after which he was succeeded by his colleagues in rotation. The clinics were overcrowded and the physician did not have the advantage of following his case to the end and verifying the diagnosis, or possibly learning from his errors for future guidance. Now each of the eight physicians is a University lecturer in charge of a teaching unit, consisting of a physician, assistant physician, clinical tutor, and resident physician. Twice a week there are lecture demonstrations for senior and for junior students, thus the student has the advantage of hearing in turn the views of the different teachers on subjects in which they may have taken a special interest. Under the charge of the clinical tutor the student refreshes his knowledge of medical anatomy, anatomy which may be made living and practical in the ward and in the X-ray department. From anatomy he passes to methods of physical examination as applied to the organs in a state of health, the basis of his whole clinical work. Too much stress cannot be laid on the importance of the teaching of normal physical signs and the physiological and physical bases on which they depend. Further, under the guidance of the clinical tutor, the student has a course of clinical laboratory methods —much of this he should already know but the course refreshes his memory and may be made clinical from the actual cases in the wards.

When the student has mastered the normal physical signs he is in a position to pass to the consideration of disease, and clinics are conducted by the physician and assistant physician at the bedside. These clinics are limited in number, and by the physician and assistant physician working in harmony there should be no difficulty in every student receiving personal care and guidance in his bedside work. The days are past when any one teacher can aspire to teach a hundred students in one clinic.

Attendance at the out-patient department is compulsory, especially for the senior student. Here disease is seen in its earlier manifestations, and he will see a clinic conducted much on the lines of house consultation in private practice, save that the assistant physician will demonstrate the case and give instruction in treatment.

Every student holds the appointment of clinical *clerk* in the wards, which is a relic of the old "apprenticeship" system, and

as clerk has a patient or patients under his direct charge. It is his duty to take a careful record of the history and examination of the patient, and to keep progress notes, and carry out all necessary clinical laboratory observations which may be essential to the establishment of a correct diagnosis. These notes are read by the physician or his assistant physician, corrected, and when completed are delivered to the physician and count to the student's record. Each student must take at least three cases in a term—nine in all. The senior student attends dispensary practice. Here he attends a polyclinic, and visits patients at their own homes under the supervision of the dispensary physician. It is hoped by linking up more intimately the hospital and the dispensary that fuller advantages may be taken of much valuable teaching material.

To the student much interest attaches to the question of examination. Your teachers are quite conscious of the imperfection of assessing a student's work in a few interviews limited in time and scope. As much may depend upon the temperament of the student and the human failings of the examiner, as upon actual knowledge. It is hoped that by keeping an accurate record of the student's career in clinical medicine that much of this examination bugbear may be got rid of. Regular attendance, careful and accurate case-taking and ward work, should count much towards the final estimate of the student, and his fitness to pass out into the practice of his profession.

It is your teachers' ambition that you should pass out of the hospital with an education in medicine which will make you self-reliant physicians. It is at the bedside that you will learn routine methods of examination, methods which will carry you successfully through practice, for you will find as your experience widens it is *by neglect of routine methods that mistakes occur.* It is at the bedside alone that the student can lay the foundations of that practical education which goes to the making of a physician. At the bedside you educate your eye, your ear, your sense of touch. At the bedside you learn to accept responsibility which if accepted in the proper spirit should do much to lighten your professional career. It is when you waken in the night and think: "If I had only done—" Then it is that responsibility weighs heavily.

Remember that much depends on yourselves, and on your enthusiasm in ward work. Lectures can teach you the philosophy and literature of medicine, but lectures, however brilliant, cannot

teach you to be practical physicians. It is in the wards and at the bedside that you must learn your medicine.

Sir, it would ill become me to close this lecture without a reference to my teachers to whom I owe so much. Alas! most of them are great personalities of the past. I began my clinical medicine under Professor Greenfield. To most of you his name stands for that of the foremost morbid anatomist of his time. To me it is also that of a great clinical teacher, who by his example, inspired me with a love for clinical work. We junior students stood rather in awe of the Professor, for he never spared us, but we recognised that he never spared himself. An untiring worker, he devoted himself ungrudgingly to his teaching and to his patients. Diagnosis was to him a fundamental factor in teaching, and he brought to bear on it an unrivalled pathological experience and a wealth of pathological knowledge. As a lecturer he had his weakness especially for junior students. He was too apt to balance conflicting theories so delicately that the student did not quite know what to believe or what his teacher believed. His critical attitude of mind seemed to stand in the way of his giving to the world the fruits of his constant labours. It is to be hoped that one of his pupils may yet give us the valuable unpublished notes and material which he has left behind.

Dr. David Brakenridge was a teacher of a different type. I served as his resident physician. A pure clinician of wide experience, he was seen at his best when, faced with a doubtful and critical problem, he would recall, for our benefit, the wealth of his clinical experience. As a lecturer his great disadvantage, from the student's point of view, was that his lectures were read from carefully prepared manuscript which he never abandoned; but if the student would but follow with care, his lectures were models of accurate clinical reasoning—a masterly exposition of the case which taught the student much.

I had the advantage of being clinical tutor to Dr. John Wyllie before he was elected to the Chair of Practice of Physic in the University. He as a teacher was one of the most popular, with junior students, that we have ever had. Who will forget his masterly method of teaching the physical signs of disease, and how he could keep the largest clinic interested in the examination of the patient.

With the late Dr. George Alexander Gibson I was long associated as assistant physician. To those of us who knew him, his charming personality will always be a happy memory. Like

Cullen, he inspired the love and reverence of the student. Many a student looks back on the time spent in Gibson's wards as one of the happiest recollections of his undergraduate career. A brilliant speaker, a student of classical English, his lectures possessed a peculiar charm. He has left behind him a record of strenuous work—work which should stand the test of time. We owe to him the first clinical laboratory which has done such useful work in the Infirmary in the past.

Dr. Byrom Bramwell is one of the teachers to whom I owe much. I acted as his assistant physician in the Infirmary. A brilliant teacher, especially for senior students, his Wednesday clinics were a feature in the medical school. His great reputation attracted patients from a wide area, and the student was sure to see the most interesting clinical cases demonstrated by a master. He is one who has added much to the reputation of the Edinburgh Medical School.

With my predecessor in this chair, Professor Russell, I first worked when he was in charge of the Pathological Department of the Royal Infirmary. Many a student now in practice will look back with gratitude on the devoted teaching which he received from Dr. William Russell. As a clinician he has given to the world valuable work, especially on the cardiovascular system—work which has made his own reputation and enhanced the reputation of the school.

To these my teachers I would offer this very inadequate appreciation of the great debt I owe them.

INAUGURAL ADDRESS IN THE REGIUS CHAIR OF CLINICAL SURGERY.

Professor Sir Harold J. Stiles delivered his Inaugural Address to the Class of Clinical Surgery in the M'Ewan Hall on 14th October. The Principal, Sir Alfred Ewing, presided, and welcomed the new Regius Professor.

Sir Harold's address as delivered has appeared elsewhere. Considerations of time prevented a section of it dealing with Clinical Teaching being read, and we are glad to be able to place this before our readers as a contribution to a subject to which the *Journal* has recently devoted considerable attention.

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Edinburgh has long been famous for the training of good general surgeons—a legacy which has been handed down to her from the days of Syme and Lister, the greatest general surgeons of their time. Edinburgh still continues to perform this important function, and thanks to our University teaching in the fundamental medical sciences, her surgeons are scientific as well as practical. But while the clinical facilities and teaching in the Edinburgh School are admirably adapted to turn out good general practitioners, it seems to me that more might be done in the way of organising the work of the hospital so as to afford greater facilities for more intensive and more original work in the various departments of general surgery. While it cannot be denied that the chief function of a large teaching hospital is to educate the student to be a good all-round practitioner, it must not be forgotten that, if the school is to keep its place in the forefront and maintain its reputation as an educational force and as a contributor to the advancement of medical science and progress, it must aim higher. It must provide the opportunity for advanced and original research in every department of clinical work.

Our American colleagues had recognised the necessity of giving these matters due consideration even before the War. In 1912, at the annual meeting of the American Medical Association, a new section was added for the purpose of discussing hospitals and the part they should play in medical education. I may here quote from the remarks made by Professor Welch (the distinguished Professor of Pathology at the Johns Hopkins Hospital), who took a prominent part in the discussion. Professor Welch is a man of such influence and world-wide reputation that I feel his words

will carry more weight than any remarks which I might be induced to make.

"The care of the sick and injured is the primary and essential purpose of a hospital. The welfare of the patient should always receive the first consideration. The plea for scientific and educational uses of a hospital could not be justified if it could be shown that such uses interfered with the patient's welfare. As a matter of fact, however, one of the strongest supports for this plea is the demonstration, based on experience and sound argument, that the interests of the patients are best served in hospitals which likewise recognise fully the needs of medical education and of scientific research. The best and most famous hospitals are of this character, and such hospitals serve the community more broadly and effectually than institutions which limit their activities merely to the care of patients.

"The most urgent problems of medical education to-day relate to the teaching of the clinical subjects. It is the so-called theoretical or laboratory subjects which are now taught practically, whereas the practical branches are taught most theoretically. . . . The heads of the departments of medicine and surgery in the University . . . should be provided also with a resident staff superior to the ordinary interne and comparable to assistants in laboratories, who are appointed for longer periods and are in training for academic careers, or the higher walks of medicine. Under such a system the hospital and the patients will be better served, medical education will be improved, and the art and science of medicine wlll be advanced far more than under the prevailing conditions."

I feel confident that all those who are interested in the welfare of the Edinburgh Medical School will be in agreement with Professor Welch.

Sir Bertrand Dawson, in his second Cavendish Lecture on "The Future of the Medical Profession," refers to the staffing of a teaching hospital in the following terms:

"All teaching hospitals must henceforth be guarded and retained for their special objects. Their prime functions are education and research. They set the standard for the rest of the country. It should not be the primary function of a teaching hospital to serve the clinical needs of the district in which it is situated. . . . The local or central hospital belongs to its town or its county. The teaching hospital belongs to the nation. . . . It cannot be expected that one hospital should at the same time

possess all the excellences. Let it develop those departments which happen to correspond to the talents of its existing staff. The junior members of a staff are of necessity men of promise rather than of fruition; from them will emerge one or more of commanding talents; let such be given increasing opportunity and equipment, and there will grow up a great department or clinic centred round the man. A great teaching hospital would then not only have beds for general medicine and surgery, but would develop special branches; further than this, there should always be beds available for collective investigation of problems which arise from time to time."

Although Edinburgh does not possess a university hospital in the strict and limited sense of the word, it is fortunate in possessing a "national" hospital, the managers of which have ever been ready and anxious to do all in their power to assist and promote medical education. Indeed, I think I may say that the Managers of the Edinburgh Royal Infirmary, its staff, and the University authorities have never been more cordially united in their endeavour to develop the educational facilities of the Edinburgh Medical School than they are to-day.

As I happen, in virtue of my office, to be the person who is responsible to the University for organising and carrying on the work of the department allotted to the Chair of Clinical Surgery, the subject is naturally one which gives me much concern. I am greatly comforted, however, by the knowledge that I may rely on the whole-hearted assistance and co-operation of my surgical colleagues in whatever constructive measures may be called for.

In a hospital without teaching responsibilities the members of the staff are not called upon to do more than the routine work necessary for the treatment of the patients. In a teaching hospital, however, the head of a clinical department is responsible for seeing that original as well as routine work is pursued: otherwise the department would not be able to contribute its quota towards the progress of medical science. In order that it may fulfil this important function it is necessary that the clinic should be provided with sufficient clinical material and that it should possess a specially selected team capable of doing advanced work. The difficulty about the system at present in vogue in our large teaching hospitals is that it is founded on the tradition that the general surgical work should be done by a number of separate and comparatively small units of equal size, each worked and staffed on a common model and each doing practically the same

routine teaching. On account of the large size of the Edinburgh Medical School, this arrangement is almost necessary, as it prevents overcrowding by allowing the students to be divided more or less equally between the different teachers. Each unit provides an excellent training for the student, but such a system is not that which is best adapted for efficient post-graduate teaching. The staff of each unit consists of a visiting surgeon, who is assisted by an assistant surgeon and a recently qualified house surgeon, who in his turn may be assisted by a qualified non-resident clinical assistant. Intermediate between the assistant surgeon and the house surgeon is the clinical tutor, who has no responsibility in connection with the treatment of the patients, his duties being confined almost entirely to tutorial instruction.

From the point of view of higher education, it is very doubtful if such a system is calculated to provide the best facilities for carrying out advanced and original work. The visiting staff and their juniors are all so much occupied with the routine work that they have little time for anything else. It is only right that the house surgeon and his junior should be fully occupied in looking after the post-operative treatment, the general welfare of the patients, and the routine work of the wards. What is wanted to make the team more efficient for more advanced teaching and post-graduate work is a young, whole-time man who has already held a resident surgical appointment, who possesses a good practical as well as a theoretical knowledge of the basic medical sciences, and who is training himself to be not merely a surgical technician but a scientific surgeon. Such a man must have given evidence that he possesses the true scientific spirit, an original and receptive mind, and an aptitude for research, more especially in its application to clinical work. The clinical tutor should be such a man. He should fill in the gap between the assistant surgeon and the house surgeon. His position should be strengthened by increasing his opportunities for original work and by giving him a larger share in the teaching. He should have charge of the clinical and pathological laboratories associated with the ward; he should attend the operations, see that the cases are properly taken, and be responsible for arranging and preserving the records. He should give tutorial instruction and encourage the students to attend the wards and out-patient departments in the evening. He should keep a record of the work done by each student, which record would be considered by the examiners at the candidate's final examination. In addition to this he himself should engage

in original scientific work in relation to some special branch of clinical surgery. As I have already stated, he should be practically a whole-time man, and it goes without saying that he should be well remunerated, and that his emolument should be such that it would not be necessary for him to have to supplement his income by coaching. Under our present system many a man who could have filled such a post with distinction has been obliged to leave his *alma mater* because the salary associated with such an office has been quite inadequate.

The War has brought into prominence the importance of post-graduate teaching, and the time has surely come for the Edinburgh School not only to take its part but to endeavour to lead the way in this connection.

In recent years there has been a tendency towards specialisation in the various departments of general surgery. The surgery of the central nervous system, of the genito-urinary system, and orthopædic surgery have already established themselves as legitimate fields for special work, and no one can deny that the intensive study of these subjects by men who had previously ranked as good general surgeons has been responsible for many of the greatest advances which surgery has made in recent years. As an illustration I have only to mention what the surgery of the central nervous system owes to Professor Harvey Cushing and what the surgery of the extremities owes to Sir Robert Jones.

It will, I think, be universally accepted, however, that a man should not think of specialising in any branch of general surgery until he has had a good training in all departments of general surgery. When he has had this, then it will make for progress, and be all the better for the patient, if he makes a special study of whatever department of surgery he is specially interested in and feels himself specially qualified to pursue. It is not necessary that he should confine himself exclusively to the particular branch he has chosen, although he may ultimately do so, and should he make a reputation in his speciality it will be because he has advanced our knowledge so much that he has become generally recognised as a leading authority in the branch he has chosen.

With regard to the position of anatomy in the curriculum, it is evident that something will have to be done to keep this fundamental subject alive in the student's mind after he has passed his second professional examination. While this can be done to a certain extent by means of classes on applied anatomy, it is my opinion that the clinical teacher should take full advantage of his

excellent opportunities for teaching anatomy on the living subject, both in the wards and in the operating theatre. With regard to surgical applied anatomy, I am convinced it should be taught in the anatomical department by a practising surgeon who has been a demonstrator of anatomy. If the class were made compulsory, as it certainly ought to be, and if the teachers of clinical surgery were careful to describe and review all their operation from the anatomical point of view, then I am at one with those of my colleagues who would do away with the present classes of operative surgery. A reform such as this would do much to keep up and augment the student's knowledge of practical anatomy; moreover, it would convert what many students regard as a dry, burdensome subject into one full of life and interest.

Professor Schafer's contention is that physiology is the pivotal science around which all the medical sciences are centred and that it furnishes a basis on which the whole of medicine and surgery is founded. While I do not wish in any way to belittle the fundamental importance of physiology, I maintain that anatomy is, and always must be, the most basic of all the medical sciences. Professor Schafer goes so far as to say that "most of the time which the student gives to dissection is—to make no bones about it—wasted." Personally I hope that the "fiat of the General Medical Council which prescribes that every student shall dissect the whole of the body in the course of his anatomical training" will be adhered to. Despite my devotion to anatomy, I am convinced that I did not spend one day too much in its practical study.

I quite agree that physiology has now become an essential part of the training of the present-day surgeon, because surgery has now become as much a science as an art. For this reason I should welcome a class on surgical physiology run on parallel lines to the class on surgical anatomy.

The extension of the medical curriculum to five years was a great advance in medical education, but the full benefits of the additional year will not be realised until further modifications in the methods and arrangement of teaching have been devised. Time does not allow me to pursue this matter in detail, but I will make brief reference to systematic lectures, which have justly brought fame and renown to this school. In former days when text-books were incomplete, these lectures necessarily occupied a large place in the time-table; but now that text-books have reached such a high standard of completeness and excellence, I venture to think that some of the time expended on systematic

lecturing could be usefully transferred to practical demonstrations in ward and laboratory. In the rearrangement of the curriculum I doubt the wisdom of the student commencing hospital work during his first year. While the short time that could be put at his disposal for this purpose would be insufficient to benefit his education, it would be long enough to divert him from the prosaic, though basic, studies (the thorough prosecution of which is essential to his future efficiency) to the more alluring life of the hospital.

INFLUENZA IN SCOTLAND.

(JULY 1918—APRIL 1919, INCLUSIVE.)

By THOMAS FINLAYSON DEWAR, C.B., M.D.

THE magnitude of the events that occurred in France, Belgium, and Germany, in Syria, Russia, and the Balkan States during the latter half of last year and the first third of this tended to divert attention from the extraordinary and most grave epidemiological phenomenon that was then taking place at home. A study of the statistical and other considerations set forth by Dr. J. C. Dunlop, Superintendent of Statistics, in a *Report on the Mortality from Influenza in Scotland during the Epidemic of 1918–1919*, recently issued, brings home to the mind what at the time was imperfectly realised. Not only does this epidemic of influenza tower over all previously recorded epidemics of similar nature; it proved the most fatal epidemic of disease of any form that has occurred in Scotland since death registration began; indeed, in view of the increase of population in Scotland during the last hundred years, it may be held as certain that at no time in the history of the country was there ever so large a number of deaths ascribed to one cause within so brief a period, namely 17,575 deaths within ten months.

The report, based upon the returns of deaths, deals with mortality statistics alone. Neither here nor from any other source is information available as to the total number of cases in the country: thus there is no means of estimating the case-mortality rate.

There is this gain in dealing with deaths alone, that presumably each record is based upon a considered diagnosis. On the other hand, as Dr. Dunlop frankly admits, there is no little reason to question the reliability of the returns upon which the report is based. The term "influenza" is ill-defined and of varied significance. To the reader of "Hirsch," or the pure epidemiologist, it is the very type of an epidemic disease, travelling at speed over vast areas, affecting almost simultaneously a large proportion of the community and affecting them gravely. But in the earlier eighties and again in the first few years of this century, the word had come to possess a nondescript significance and to include every coryza, febricula, and passing malaise accompanied by pyrexia. In fact it was little other than a civil equivalent of "P.U.O." So loosely

and freely was the term employed that the present writer has known of cases of mumps, diphtheria, scarlet fever, smallpox, typhus fever, enteric fever, measles and cerebro-spinal fever that were initially—but quite deliberately and formally—diagnosed as "influenza."

It being understood that the basis of Dr. Dunlop's report is the "number of registered deaths attributed to influenza," with all the qualifications that that basis implies, let us examine the figures in some detail. The incidence curve of the epidemic does not follow the usual parabolic form. It has an immediate high elevation, a fall to only two or three times the normal, followed by the first of two high peaks; after a marked decline extending over two months, it again rises in the spring of this year, to fall by "crisis" in April. In normal times, that is to say, periods when influenza is not epidemic, two or three deaths are on an average attributed to influenza in Scotland daily. But—

in July 1918 the number was	24·8
„ Aug. „ „ „	7·5
„ Sept. „ „ „	7·7
„ Oct. „ „ „	119·8
„ Nov. „ „ „	137·8
„ Dec. „ „ „	50·6
„ Jan. 1919 „ „	25·2
„ Feb. „ „ „	98·1
„ Mar. „ „ „	81·6
„ Apr. „ „ „	13·8

Practically all maladies that chiefly affect the respiratory organs show a seasonal curve with the maximal incidence in winter and early spring. The view is fast gaining ground that this is not directly due to temperature or moisture in the air or to rainfall, but is occasioned by the fact that in cold and inclement weather and ungenial seasons people are less in the open air than at other times and thus are more exposed to the devitalising and resistance-lowering effects of indoor conditions and, in particular, to the breathing of deteriorated and stagnant air.

In the great majority of cases of influenzal type that end fatally the final cause of death is pneumonic or at least pulmonary in site. It is for this reason the more remarkable that in the incidence chart before us there should be a well-marked dip in the midwinter months of December and January. It is a familiar feature of epidemics as, for example, of enteric fever, that in the earlier part of the outbreak many cases are overlooked, while

during the defervescence of the epidemic many cases are notified which are of entirely dissimilar nature. No doubt that happened in the instance under review; but at most it goes but a small way towards explaining the second peak of the curve.

Study of the number of deaths annually ascribed to influenza in Scotland since 1886 reveals several matters of interest. For the first four years of that period (1886–1889) only one death per week, on an average, was certified as due to influenza. Never since 1889, even in non-epidemic years, has the average been less than one per day. Why is this? Almost without doubt it is due to an altered meaning of the term "influenza." Before 1889—except to those who remembered 1847*—influenza was a trivial disease of little more than domestic significance.

After the great epidemic of 1889–1890, the first of importance in Britain for upwards of forty years, the meaning of the word changed. It came to be applied more widely and more loosely. The deaths ascribed to influenza in Scotland in the years 1889 and 1890 together were 965; but in the following year when, according to outward indications in the community, the brunt of the epidemic was past, as many as 2508 deaths were certified as having been caused by it.

In that year (1891) the average daily number of deaths ascribed to influenza in Scotland was 6·9; in 1900, the next great epidemic year, the number was 7·9; while in the present period reviewed by Dr. Dunlop, the daily average for the ten months reached the figure of 57·8.

It is scarcely to be doubted that the mortality figures for influenza in Scotland for the last thirty-three or thirty-four years have to be interpreted in the light of changing medical nomenclature. After each well-marked epidemic there is a tendency to diagnose as influenza many conditions of aberrant type; that tendency slowly attenuates through the years until another general outbreak occurs.

In an instructive and impressive table, Dr. Dunlop compares the mortality attributed to influenza in Scotland in 1918–1919 with that resulting from the most extensive outbreaks of other infectious diseases during the past sixty-five years. He shows that the next most fatal epidemic—that of scarlet fever in 1874–75—caused less than 63 per cent. of the number of the deaths due to influenza in the period from July 1918 to April 1919, and that the two epidemics

* The 215 deaths ascribed to influenza in the years 1886–1889 inclusive were probably certified, for the most part at least, by elderly practitioners.

next in fatality—those of measles in 1893 and diphtheria (with croup) in 1863—each caused only one-fifth as many deaths as influenza in the incomplete year under review. Two epidemics that happened about half a century ago are still vividly remembered by old people—that of cholera in 1866 and that of smallpox in 1872. These caused great public anxiety and excitement; yet they caused but 7·2 per cent. and 14 per cent. respectively of the number of the deaths ascribed to influenza in the ten months ending last April.

By yet another comparison Dr. Dunlop brings home to the mind the magnitude of the outbreak whose figures he records. The deaths from influenza in the latter half of last year and the first six months of this were between three and four times as many as the average number due to phthisis in a year.

Dr. Dunlop finds significant statistical indication that the number of deaths registered as due to influenza leads to an inadequate rather than to an excessive estimate of the actual mortality from this cause. In the months in which influenza was most prevalent (as shown by the death returns), the death-rate in the larger towns was in excess of normal by a number far above that in which influenza was given as the cause or one of the causes of death. Moreover, he finds that, month by month and even week by week, as the influenza mortality rose and fell, the numbers of deaths from pneumonia and bronchitis rose and fell in unison, except that the rise and fall in the latter transcended the swings of the curve of influenza. That may of course mean only that climatic conditions which favoured or militated against one disease acted similarly in regard to the other; but it strongly suggests that the association is causal and not merely accidental or coincidental. Reviewing all the figures and the circumstances, Dr. Dunlop considers that the deaths ascribable to influenza in the period in question may be reckoned as amounting to nearly 22,000: this is equivalent to an annual death-rate of 5·3 per thousand of the estimated population.

Geographically, the epidemic was almost universal throughout Scotland. The cities and large towns, the small towns and rural districts, suffered in approximately equal degree. The incidence as evidenced by mortality showed variations not much, if at all, beyond expectation; and there is no general indication that the north suffered more or less than the south or the east than the west.

Perhaps even more striking, epidemiologically, than the

magnitude of the epidemic, is its peculiar age-incidence. In the epidemic of 1900 about 7·5 of the deaths were under 5 years of age, early youth was almost immune, the incidence steadily but slowly increased during the middle years of life, and over 68 per cent. of the deaths occurred at upwards of 55 years of age. But in the recent epidemic the age-distribution was radically different. Fully 14 per cent. of the deaths occurred under 5 years of age, only 18 per cent. of the deaths occurred at over 55 years of age, and the largest mortality (over 50 per cent. of the whole) occurred between the ages of 15 and 44, and almost a quarter of the whole in the prime of life between the ages of 25 and 44. These are very surprising figures. They prove indubitably that the nature of the epidemic of 1918–1919 was radically different from that of the epidemics of 1889–1890 and 1900. The two latter were chiefly fatal to the weak and feeble at the two extremes of life. The former was more fatal in young children than in infants, and far more so in the middle of life than at either of its extremes—28 years being the age of maximum incidence. Alike in the epidemics of 1900 and of 1918–1919 the numbers are amply large enough to justify confident inference; and the contrast in age-incidence is so great as to evoke doubt as to whether we are dealing with the same disease.

Of course, the figures given are not to be taken as indicating that influenza was less fatal among the old than among those between the ages of 25 and 35. As a matter of fact, the death-rate among the very old (over 75 years) was, as might have been expected, the highest of all. The notable point is that, while in earlier epidemics of influenza deaths from influenza were relatively few in early adult life (13·8 per cent of the whole at ages 15 to 44 in the epidemic of 1900 and approximately the same in other early epidemics), in the epidemic 1918–1919, 50·1 per cent. of the total deaths, or almost four times as large a proportion as in the earlier outbreaks, occurred within the age-period 15 to 44.

Of all the deaths of which influenza was named as a cause, only one-sixth were ascribed to influenza alone: almost two-thirds of the total number were attributed to influenza and pneumonia. "It is the relative frequency of death from influenza in association with pneumonia which accounts for the frequency of influenza deaths in the younger adult age-periods." Fully one-fourth of the deaths ascribed to influenza and pneumonia together occurred at ages between 25 and 34. Thus both the high fatality of the

epidemic and the peculiarity of its age-incidence are associated with the occurrence of pneumonia as a sequel to influenza.

In the report a very full statement is given regarding the association of influenza with other diseases as a cause of death: but its value must be considerably discounted by the lack of uniformity in the methods of death certification, some doctors preferring to indicate only what they regard as the essential cause of death while others insert abnormal states of health which may have only a slight or even insignificant effect in determining a fatal result.

The report is well worthy of perusal in full by all who are interested in influenza. The unbiassed reader cannot but form the conviction that the recent epidemic was essentially different from any that preceded it; and that the element of pneumonia in the epidemic far outweighed the element of simple influenza in bringing about the magnitude of the outbreak and its unprecedentedly high mortality.

A FIELD AMBULANCE IN GALLIPOLI, EGYPT, PALESTINE, AND FRANCE.

By JAMES YOUNG, D.S.O., M.D., F.R.C.S.(Edin.),
Lieutenant-Colonel, R.A.M.C.

XXI. France.

The preceding chapters of this narrative were written during the war, when punctilious secrecy was imposed on even the most modest literary effort. This stifling embargo removed, it is now possible to discuss events and places without restriction; though so powerful has a habit of over four years become, that the pen finds itself even now instinctively recoiling from any revelation of time or place.

It was at the end of March, in the midst of preparations being pushed rapidly ahead for a further advance of the 52nd Division north of Jaffa, that the news was burst upon us that we were to be withdrawn from the Palestine army. Within a few days all our animals—horses, mules and camels—were returned to Remounts. There was many a sad parting between horse and man. All vehicles went back to Ordnance. With the loss of our transport we sent back our native Egyptian drivers to their dépôt.

The rapidity of our movements is evident when it is stated that the 1/3rd Lowland Field Ambulance entrained at Ludd (Lydda) on the 4th April and detrained at the dock at Alexandria on the 6th April. This is the most rapid transit we ever made. It was evident that something important was afoot. We had then no knowledge of the acute crisis that faced the army in France at this time. Our thoughts were engaged with the discovery that after all the staff *could* move troops rapidly. Then we felt, more than actually knew, that we were going to France. Vistas of home leave opened before us. Some actually had it that we were going home for a long rest. This pleasing rumour had many adherents, for most of the men in the ambulance had been away from home for nearly three years.

We embarked at once, two sections of the unit on the *Kaiser-i-Hind*, the other section on the *Malwa*.

The spirits of all ran high. The relief that filled our minds can be understood only by those who have spent long, weary months in the battle-zone. The reaction brings an inevitable

tendency for discipline to slacken. And so it was with us. Once embarked, no one, except on urgent business, was allowed to land. But some gallant youths, determined to steal another few hours ashore, hit on a happy plan. Regardless of the risks and penalties of detection, with bayonets fixed they formed up on deck. An N.C.O. gave the command, "Attention—form fours—right," and with perfect composure the whole party stepped off across the gangway to the shore, everybody making way for them, in the belief that they were marching to some detailed picquet duty. Later on, after they had had their fling ashore, they marched back in the same soldier-like fashion. It was a fine piece of bravado and no one was the wiser. The story leaked out many weeks after, when all chance of detection had passed. Those men almost deserved their stolen pleasures!

We arrived at Marseilles on the 17th April and were soon conscious of the reasons which had hurried us so swiftly from Palestine. We were the first division sent from Palestine, but we soon heard that others were following close on our heels.

The first few weeks were spent in equipping. We had to get a complete new transport, motor ambulance cars, horsed ambulance waggons and all the other vehicles that go to make up the establishment of a field ambulance in France. Then we drew horses from Remounts. Within a short time we were complete and ready for the road.

We recall our impressions of the new country to which the call of battle had brought us. Many a time in the East we had nursed a longing for a taste of the intense and stern life of the Western theatre of war. As the years rolled on the prospect seemed to become more and more shadowy, and it almost seemed as if we were fated to grow old under tropical skies, when with a suddenness which still left us wondering we found ourselves carried over the dividing seas and planted down in the very midst of the Western battle.

Our first and dominating impression, and it was one which remained with us throughout in France, was that here we were mere small cogs in a vast machine. In a smaller army a division is an important unit. We came to France with our breasts filled with pride at the deeds of our division, but we found that few knew us and fewer seemed to care. If they spared us a thought, it was probably to sympathise with our position and to wonder of what use we could possibly be in France, with nothing but the experiences of wild campaigns to our credit.

And very soon we began to feel our ineptitude. Everything seemed to be different, and we arrived at a time when the whole aspect of affairs wore a look of intensity and strain, a fact which did not help us to settle down any more comfortably. We had to master a thousand and one new regulations regarding administration and discipline and all other matters—the accretions which the system in France had gradually gathered round it during years of war. We had learnt about gas in the East, but there we had merely philandered with it. For during our whole campaigning we had never once experienced it. But here it wore a visage of grim terror which we soon learnt to recognise. With many a cough and splutter we gradually inured ourselves to the discomfort of the gas-mask until we could carry it with impunity for hours at a stretch.

After a time the strangeness which we experienced at first began to wear off. Our early *gauche* efforts in a strange environment began to give place to increasing confidence, as we grew familiar with the new methods of war which we now met.

War is a stern, ruthless mistress! A man's worth is under a constant, searching test. The critical glances of a hundred eyes follow his every movement from morning till night. The gaze of his fellows impels him continuously to greater and greater effort. This publicity is part of the alchemy that so often transmutes the commonplace into the heroic, though there are other more truly ideal factors in the battlefield that stir the nobility that lurks somewhere in even the most tawdry of God's creatures.

The public glare is on every man and, whilst it stimulates to better deeds, it at the same time quickly lays bare the chinks in the armour. A man may toil to his utmost and fail. In war, failure is a sin for which there is no remission. Nothing will do but success. A man's best is not enough. Especially did this stern code apply to our leaders. The sergeant or the lieutenant might evade the major penalties, but the colonel or the general paid to the uttermost farthing. Soon after we reached France we found that one commander after another had disappeared in the night and in the morning a new power ruled in their stead, and so rapid and so frequent were the changes that often we had not learnt the name of one before another and fresh dynasty was installed. For a bit every commanding officer quaked in his shoes, though one general, in an endeavour to anticipate his demise with a joke, had a "bowler hat" continually dangling over his head in his dug-out, which he ordered his staff-captain to lower as his

fortunes drooped and to raise again when the next minute to the correspondence lifted the suspense for the moment. This general was one of the few who survived!

Amongst the other impressions which filled our early days with crowded interest was the tragedy of desolation and destruction which met our eyes on every side. There is no fairer land anywhere than the broad-spreading woodlands and rolling fields with the bright, open towns and villages of the northern provinces of France. Driving along the wide roads through such scenes, the heart is filled with rejoicing that in war the face of Nature can still retain the semblance of a smile. But a short mile or so from these signs of peace and beauty you plunge, often without warning into a mangled maze of withered woods and torn roads leading to towns that are now nothing but empty, gaping things. Their broken walls stand amid a ruin of *débris* like shattered gravestones brooding in silent protest over their desecrated dead.

We can never forget the first such place we saw. It had been a fairly large factory town. In its stead there was nothing but shattered, tottering walls and great masses and columns of twisted iron. An advanced dressing station was built into such a derelict mass with sandbags and corrugated sheeting. Above it there towered what had once been a gigantic factory building with belching chimneys and hundreds of busy workmen. One could picture the smoke and heat and manifold signs of human activity of former times. These had all gone and instead there was left only a great, empty, forbidding latticework of broken metal. Pillars and beams, loosened and loosening; some torn outwards and hanging at awkward angles, as if at any moment they might come crashing to the ground

This sight was the first view of the titanic havoc of modern war which we had. It stands out clear against the background of memory, though many times after we saw sights of destruction beside which this town of Artois was like a mere tumbled house of cards. Later on, when the victorious advance commenced, we marched through one town after the other all levelled to the ground. Especially can we never forget the broad town of Lens, in which there was not a single wall standing—it was nothing but a sprawling mass of broken brick.

But the ruthless devastation that lies across the fair face of France like a festering blight has received more eloquent expression than this modest narrative can aspire to. The reality of the horrible thing can never be known except by those who have seen

the homeless women of France lamenting in an agony of tears over the ruins which they once called home. We remember once meeting a French soldier in a forsaken village which we entered soon after the Germans had left. He had collapsed with the exhaustion of a sixteen hours' cycle ride back to this, his native village. He had arrived soon after us and we found him standing beside his crushed home. It was the only house damaged in the street, blown from its foundations by a heavy shell. During more than four years he had dreamt of his homecoming. During the crash of battle the vision of his wife and children had ever floated before his eyes, and he had clasped to his breast the fervent hope of the meeting, when the tide of battle had turned and his ravaged France was rescued. There we found him, dazed with fatigue and distracted with the horror that he saw and the longing and the agonising fear of uncertainty for his dear ones. For four long years he had dreamed of home, and there was nothing but blasted, gaping walls. And his loved ones, where were they?

XXII. Vimy Ridge.

On the 8th May we first went into the battle line. It was at Vimy, a place hallowed by many days of strife and sacrifice, though, when we took over, this sector of the line was comparatively quiet and it remained so during the whole period of our occupancy. The 51st Division, we remember, was on our right and the 24th Division was on our left when we moved into position.

The whole front occupied by our division was evacuated through two dressing stations—one in Vimy village, the other about a mile north of this, just beyond the Vimy Ridge. The village, like every other village or town near the front line, was shattered by gun-fire. Most houses were damaged beyond recognition, others were completely demolished. The station we found ourselves in occupation of was in the cellars of a house almost completely destroyed. It was quite close to the front line and was approached by a road that wound across the top of Vimy Ridge and then down its eastern slopes to the village which lay on the western edge of the flat plain that spread for miles of bare desolation eastwards into the German area. The road was in full view of the German lines and was shelled daily. The Boche sanctioned no traffic on it. Even small parties of men would bring a salvo crashing about our heads. But by a grace which we

could not fail to appreciate, he allowed our motor ambulance cars to employ the road without molesting them, so that we could carry out our evacuation of sick and wounded during the day. But no other cars were allowed.

The other station was dug deep into the ground, twenty feet or thereby under the surface, a series of branching passages and chambers fitted with wooden cots arranged in tiers. It was originally a German dressing station and it was constructed with all the completeness and luxury which the Boche knew how to expend on his dug-outs. It was approached by two staired passages, one at each end, so that if one were blown in escape was always possible by the other.

This station was safe. During the severest shelling, with the gas curtains drawn, you could live your life underground without fear. One of the great consolations of the trench life of France was this large provision of dungeon dugouts proof against the heaviest of shells. Our boys had known no such luxurious safety in the trenches of Gallipoli or Gaza and they welcomed it.

The main dressing station of the ambulance was at Aux Rietz, about four miles behind the front line. Motor ambulance cars carried out all the evacuation of sick and wounded from the two advanced posts. The roads so near the front line are always bad, as they are constantly being shelled. The road across Vimy Ridge was very bad, and being in full face of the German observers it was impossible to repair it. Any efforts made under cover of dark would become visible during the day and the German guns would soon efface any such repair, so that we had to bump the Talbots at a crawling pace across roads which became worse day by day.

Despite it all the motor-car was indispensable in forward area work. In France it had a place here which had not been possible in Palestine for ordinary daily routine evacuation, where horsed ambulance wagons were used in front of the main dressing stations. There roads had to be specially made before motor-cars could be run forward.

Behind the divisional areas in France, that is, roughly, behind the main dressing stations, the roads are maintained in repair and the journey to the Casualty Clearing Station was carried out in comparative comfort. During the days of trench fighting those stations were a matter of five to seven miles behind the main dressing station of the field ambulances.

The forward area was barren and cheerless, nothing but

trenches in endless succession crossing country denuded of houses and people and every living thing. Nothing to relieve the bare monotony except when, in the late spring and summer, a mingled blaze of blossoms grew along the parapets of the older trenches, and you walked forward to the battle-line between banks splashed with colour and flowers that bent low on either side to stroke your face and to breathe a fragrance that was out of keeping with the place. Otherwise the front area was barren and desolate. But within a few miles, where the hand of war had not laid its destroying touch on everything, the country was pleasant and beautiful. In spare hours a favourite respite for all ranks was to drive down to the Casualty Clearing Station with the motor ambulance cars carrying back wounded or sick to the hospital. Then for a brief spell they stole away from the shambles of desolation and with a turn in the road were amongst clean fields and smiling country. It was a glimpse of Paradise to minds and bodies stunted and stifled by the things of Hell. For the moment the heart rejoiced and was better. But with the evening they had to turn from their fevered pleasures, sucked back by the surge of sordid things. For long days round the mess table they would linger in memory on the happenings of those few breathless hours, on the friends they had seen or made, and on the strong women in the hospital who, out of the sympathy of their hearts, had talked and smiled, knowing full well what the few hours of their company meant to spirits that often must have seemed as if wearied out of all hope in life.

XXIII. Breaking the Hindenburg Line.

Towards the end of July the division was withdrawn from the line which it had held in front of Vimy for over two months. We proceeded to rest, though to be ready to move at six hours' warning. The German *débâcle* between Soissons and Rheims had inspired the hope that the tide of battle had turned, and we knew that big things were in progress, in which we were soon to have our share. The ambulance moved to a pretty little village—Fresnicourt —lying at the foot of a wooded slope. For the first time for many weeks we slept in peace, undisturbed by the menace of bombs. There was nothing more disquieting and sleep-dispelling than the constant double hum of the Boche planes and the crash of the bombs as they fell in repeated succession all round your camp. For some weeks previously we had been in tents at Mont St. Eloi.

The shattered tower that stands on its prominent hill was easily picked out from the air, even on a dark night, and the German planes used it as a guide during their nightly forays. Every night, save during stormy weather, we had gone to sleep with the air filled with the rhythmic din as the planes passed over our heads on their outward or homeward journey, and many times of a night we were wakened shuddering by the crashes that shook the earth, though the bombs might be falling a mile or more away. If you have once known by personal experience the awful havoc that a bomb can create in your midst, you remain ever after the victim of a wholesome dread. We remember how after one such experience the mere sound of a plane in the air for several days made our nerves tremble in a manner that left us ashamed.

After about a month's rest spent in the neighbourhood of Aubigny-en-Artois we moved forward, this time to battle. Within a few days we found ourselves in the 17th Corps hammering at the German positions near Mercatel.

Within a few days of leaving the rest billets the 52nd Division was thrust into the first battle it had seen since coming to France, and by a turn of fortune the area chosen for their new baptism was one of the vital spots in the German line. The fighting was intense from the beginning, but the men were heartened by finding that the Boche was gradually driven further and further back, until he finally took his stand firmly at the Hindenburg Line—that fortress of deep, labyrinthine trenches reputed to be impregnable.

It is matter of history how the 17th Corps broke through and placed itself astride the Drocourt-Queant Switch and thus for the first time broke the line whose name was awe.

These were great days for the ambulance. We were busy in front and we were busy behind. The advanced dressing stations had to push forward in the wake of the advancing troops, often moving two or three times a day. The main ambulance was converted into a corps station to tap the wounded of the whole corps of three divisions. Days and nights were filled to the brim.

But the casualties were heavy and our division was thinned more than it had ever been since the days of Gallipoli or the first battle of Gaza. The fighting in France was never so acute as on these occasions when, in a few hours, before solid, impregnable defences, battalions were mowed down like ripe corn. In France, however, the fighting once started was constant and the wastage

of a few days would bring a full battalion down to a mere handful of men.

The brigade with which we immediately worked was commanded by a general who fretted in leash during times of quiet, but who, during times of battle, was possessed by an energy and driving vigour that were dæmonic. There are some men who in rest are gentle and retiring to the extent of timidity, but who, during the heat of battle, become transfigured. The passion of the fight burns out all the gentler virtues and inflames the temper and rouses the spirit to herculanean effort and action. The crash of the conflict, that numbs other and brave souls into palsy, seems only as music to them, piping them onward with head erect and eyes aflame with keen joy through danger and death itself. There are many such. During a battle you will find yourself surrounded by them and your heart thrills with pride for your fellow-men. The spirit is infectious, and when you are about to falter and fail you catch a glance of an intrepid soul pressing on with laughter in its eye through the shambles of death that trips the feet and strangles the very breath. The sight does you good and you carry on anew when hope seemed very nearly dead.

At this time we had a general who had a disregard for death that to many seemed foolhardy and to some seemed insane. We had known him in Gallipoli as a captain in a neighbouring division and an early death had been prophesied for him by many. Some years before us he had come to France and, instead of finding death, he had won fame and glory. It is only a mere fraction of such spirits that can long survive. A V.C. always seems to us in fancy as surrounded by thousands of lifeless forms, each of whom might have earned the highest of honours. He and a few others alone remain of that great band of gallant spirits.

Our brigadier had won the V.C., the D.S.O., and the M.C., and you were not a minute in his company during a battle before you recognised that he could not help earning distinction in the field, so long as life remained in him. Life to him then was as cheap as a straw blown by the wind. In his last battle he had had five horses shot under him within a few hours, as he rode along the front line rallying his men to stand, when they were being overwhelmed by countless hordes.

To a man less inured by temper or training to such a callous outlook on the fight he was not a wholly congenial companion. We remember seeing him on the parapet during the early days of the autumn fighting, when the whole blast of the battle seemed

to concentrate itself round the spot. With a concentration that might have been focussed on a rising covey of partridges instead of on a field blackened by shell and shaken in an agony of human hate, he pointed to Henin Hill where the Hindenburg Line could be seen by its stretch of white parapets and showed where the trenches would be attacked and taken. And he and his men were as good as the spoken word.

These were days to fill the cup of life to the very brim. Mind and heart and body were concentrated in a harmony of constant and intense action. The 52nd Division aquitted itself with credit and, the license of the Press being about this time greatly extended, the papers vied with one another in praise of the division which in Palestine had performed a prodigy of valour during its three weeks' pursuit of the Turks, when, fighting practically all the way from Gaza, it had only stopped at the gates of Jerusalem. Now, side by side with other two divisions—the 56th and the 63rd—it had broken through the Hindenburg system which, by those able to judge, had been many times pronounced impregnable. It was an interesting experience for us to be again fighting shoulder to shoulder with the Royal Naval (or 63rd) Division, which we had not seen since the days of 1915, when the two divisions struggled together in vain on the slopes of far-off Achi-Baba.

It is not surprising that, though thinned by days of hard strife, the *morale* of the battalions had never been better. The heroic stand of the five heroes of Mœuvres who, though cut off from their battalion, held out against the Germans for forty-eight hours till they were relieved, only served to whet the spirits of the division that were stirred as they had never been before.

After some days of well-earned rest, during which needed reinforcements were pushed up, the division set off in pursuit of the retreating Boche. This time our road was through Lens and we did not stop till the conclusion of the armistice brought us to a halt at 11 a.m. on the 11th November, 1918, some miles north of Mons in Belgium.

THE END.

CRITICAL REVIEWS.

GASTRIC SURGERY.

By D. P. D. WILKIE, F.R.C.S.

THE period of the war has not been marked by any epoch-making advance in the surgery of the stomach and duodenum. With the diversion of surgical enterprise to other fields it has, however, served as a time for review of the results obtained in gastric surgery during the preceding ten years.

In the field of diagnosis the use of X-rays after an opaque meal has become much more general. The value of X-ray evidence, however, although in certain cases conclusive, is frequently limited. It must be used merely as an adjuvant to a careful clinical examination, for where it is allowed to dominate the clinical investigation mistakes are but too frequent. As a means of determining accurately the position, size, motility, and emptying power of the stomach, the presence of chronic perforating ulcers and of hour-glass contractions, X-ray examination has now become the recognised means of precision. For the early diagnosis of gastric carcinoma X-ray examination should never be omitted. Hartung [1] claims that negative X-ray findings practically rule out gastric cancer and maintains that patients over 40 years of age who have gastric symptoms of doubtful origin should invariably have the benefit of such investigation. Baetjer and Friedenwald [2] in a comprehensive study of cancer cases fully bear out this view, and Boggs [3] maintains that X-rays will reveal more gastric cancers in the early stage than any other method of examination.

THE SURGICAL TREATMENT OF GASTRIC ULCER.

There is steadily accumulating evidence that for gastric ulcer in the usual site, namely on the lesser curvature, gastro-enterostomy alone is a very uncertain method of gaining relief. Excision of the ulcer alone is also frequently followed by recurrence. Balfour [4] found that further operation was required in 32 per cent. of cases so treated. A combination of these two methods, whereby the ulcer is either removed or destroyed and a gastro-enterostomy performed, is the procedure which has given the most uniformly satisfactory results.

The difficulty has been to find a method which, while dealing in a radical manner with the ulcer, was yet unassociated with any considerable risk to life. In the case of the smaller and mobile ulcers, excision

either by a wedge-shaped resection or by Balfour's cautery method offers no serious difficulty or risk. Balfour frees the portion of the gastro-hepatic omentum in the region of the ulcer, shaves off the thick callous peritoneum over the ulcer, revealing a minute but very definite point in the thickened wall, this point representing the centre of the ulcer. He then carries a Pacquelin cautery through the ulcer until an artificial perforation is produced. Slowly he destroys the whole ulcer with the cautery and closes the opening in the stomach by suturing in layers. The reflected gastro-hepatic omentum is then replaced as reinforcement of the suture line.

Balfour,[5] in recording 214 cases treated by this method in the Mayo clinic, discusses the rationale of the procedure and the minimal risk attending its use. Its value seems to depend largely on heat and perforation—the former as a sterilising agent, the latter in accordance with the clinical fact that the spontaneous and complete perforation of a gastric ulcer is so frequently followed by a cure of the ulcer symptoms. He draws attention to the common observation that in ulcers, particularly those of the lesser curvature, the induration is out of all proportion to the size of the crater. Excision by knife sacrifices the protective induration with which Nature attempts to wall off the infective foci in the crater. Sterilisation and destruction of the crater by the cautery leaves the indurated area, which as experience has proved may return to normal. By conserving the tissues of the lesser curvature in this manner it has been shown by subsequent X-ray examination that gastric motility is impaired to a much less degree than after the wider excision of tissue practised with the knife.

In 186 cases in which cautery excision was the major operation, gastro-enterostomy being also performed, there were only two deaths, the one from pulmonary embolism on the eighth day, the other from pneumonia on the twentieth day. The operative risk is therefore no greater than that of simple gastro-enterostomy. The late results were found to be much better than those in the cases where knife excision had been performed, for whereas in the latter 15 per cent. of patients reported that they were no better since operation, in the latter there was no case of failure to give relief. These facts are the more striking when it is remembered that knife excision was done only when the conditions were favourable, whereas the cautery was frequently used in cases when excision was unwarranted because of the size, fixity, or situation of the ulcers. An objection has been raised to the cautery method, in that it does not remove entirely those ulcers which may be tending to undergo malignant change. Balfour meets this objection by pointing out that it is very rare for an ulcer to undergo malignant change after a gastro-enterostomy has been performed and that operation is always combined with the cautery method, and further that the

heat used to sterilise and destroy the ulcer may quite probably also kill any malignant cells which are developing in its margins.

Where the ulcer is large but mobile and there is a real suspicion of malignancy a partial gastrectomy may be done, the stomach being divided proximal to the ulcer and the distal portion of stomach being then removed down to the duodenum. The functional result following this operation is very good, but it is by no means free from risk to life and not infrequently the actual size of the ulcer when viewed from the interior is found to be small compared with the large portion of stomach removed.

According to Balfour, ulcers on the anterior wall of the stomach form only 1 per cent. of cases operated on, those on the posterior wall 10 per cent. The ulcers on the anterior wall can be readily dealt with by excision and suture in layers. The removal of ulcers on the posterior wall presents a much more difficult technical problem. If the ulcer is not densely adherent to surrounding organs excision by the transgastric of Mayo is the method of choice. In this operation access is obtained to the ulcer through an opening in the anterior wall of the stomach. The ulcer is then encircled by an incision dividing all the coats of the stomach and the edges of the incision are brought together in layers from behind forwards. Excellent results follow this operation and the risk to life is small.

Pauchet[6] describes a method of gaining free access to the posterior wall of the stomach, by dividing the omentum along its attachment to the transverse colon, throwing the whole omentum upwards. A free exposure of the posterior wall of the stomach is thus obtained, and an ulcer can be excised from the peritoneal aspect.

Where an ulcer on the posterior wall is adherent to surrounding structures partial gastrectomy is the only radical method of treatment. The stomach is divided proximal to the ulcer, and thus free access is obtained for the division of adhesions to the pancreas and ligation of bleeding vessels as the stomach is peeled off the pancreas to the right.

For ulcers of the pyloric region gastro-enterostomy alone gives quite satisfactory results. There is, however, a growing recognition of the relative rarity of ulceration in the pyloric canal and of the fact that what we formerly called pyloric were in reality duodenal ulcers.

For a very large callous ulcer situated high up on the lesser curvature of the stomach, a temporary jejunostomy either alone or combined with a gastro-enterostomy as recommended by Moynihan is the best form of treatment. By giving the stomach absolute rest for a period of months, healing of even the largest ulcers has been found to be possible.

As probably the majority of operations on the stomach are performed for the relief of duodenal ulcer, this condition must be considered in any review on gastric surgery.

Surgical Treatment of Duodenal Ulcer.

The frequency of this condition having now obtained universal recognition, and surgical treatment having been so widely employed, it is now possible to adjudge the advantages and limitations of operative treatment.

It may at once be said that the operation of gastro-enterostomy has attained its established place as one of the most satisfactory operations in abdominal surgery mainly as the result of its use in cases of duodenal ulcer. The large and eminently satisfactory class of cases formerly termed simple pyloric stenosis with dilated stomach must be included here, because simple pyloric stenosis is relatively rare whilst duodenal stenosis is very common. A stenosis of the duodenum leads to a dilatation of the pylorus behind it, and unless carefully examined the narrowed part looks like and is frequently taken for the pylorus. Whilst a posterior gastro-jejunostomy has been the operation most commonly employed in cases of duodenal ulcer, considerable difference of opinion has existed as to whether, in addition, the duodenal ulcer should be excised or invaginated or whether the pylorus should be occluded or actually divided. Simple excision of the ulcer alone has been proved to be unsatisfactory partly because there is frequently more than one ulcer and partly because the factors which favoured the origin and persistence of the ulcer are left undisturbed. The first of these reasons also rules out excision as a routine measure in conjunction with a gastro-enterostomy. Infolding of the ulcer is strongly recommended by Moynihan,[7] who quotes Mitchell as having proved that infolded ulcers rapidly heal, and also because subsequent perforation is thereby precluded.

In regard to artificial closure of the pylorus there is still much difference of opinion. Some surgeons insist on this procedure as an essential part of the operation. The experiments of Lewisohn,[8] who found that after gastro-enterostomy on dogs the administration of thionin blue solution by a stomach tube caused a deep staining of the duodenum if the pylorus had not been closed, are frequently brought up as an argument in favour of pyloric exclusion. The conditions when one is dealing with the healthy stomach and duodenum of the dog are however quite different from those in the human subject with a duodenal ulcer, probably some stenosis and almost certainly some degree of pyloric spasm. Crile[9] and Jacobson and Murphy,[10] from X-ray observations after gastro-enterostomy, report that the opening was found to be functioning equally well whether the pylorus had been closed or not. The investigations of Webb and Kinghorn[11] on the radiographic appearances after gastro-enterostomy showed, moreover, that in some of the most successful cases the bismuth was passing almost entirely through the pylorus.

The one condition in which closing the pylorus seems to be clearly indicated is where the gastro-enterostomy is done for duodenal ulcer with repeated hæmorrhages. Here the ensuring of immediate rest to the duodenum is particularly desirable and the temporary nature of the closure does not lessen its efficiency. The simplest method is to encircle the pylorus with stout catgut, tie firmly, and cover with one or two Lembert sutures.

In certain cases of duodenal ulcer where anatomical peculiarities, either congenital or the result of inflammation, would have made a posterior gastro-enterostomy a matter of serious difficulty Balfour has obtained very satisfactory results from gastro-duodenostomy. The ulcer itself is not excised but merely invaginated and the anastomosis made entirely in healthy tissue. To permit of free exposure and absence of all tension the duodenum may have to be mobilised. This operation, which is the same as that described by Eiselsberg twelve years ago, has been found to be particularly useful in a very difficult class of case, namely, secondary operations for gastro-jejunal ulcers. After removing the old gastro-enterosomy and closing the stomach and jejunum gastro-duodenostomy is performed.

Unsuccessful Gastro-enterostomy.

During the past year a considerable amount of attention has been directed to the subject of disappointing results after the operation of gastro-enterostomy, and it is clear that not a few medical men have come to doubt the benefits to be derived from the operation even in cases of duodenal ulcer.

Whilst it cannot be denied that many patients who have undergone this operation have, instead of being relieved, been made more miserable it is still true that gastro-enterostomy in appropriate cases is probably the most satisfactory operation in surgery. In exhaustive investigations Wilensky,[12] Smithies,[13] and Moynihan have sought to sift out the conditions which have proved to be unrelieved by gastro-enterostomy and to indicate the technical defects in the operation which may lead to subsequent trouble. The analysis of the disappointing cases has brought out very clearly the fact that in practically 90 per cent. of the cases the operation was done for the relief of symptoms without there being present those organic lesions in the region of the pylorus and first part of the duodenum which constitute the true indications for the operation.

Since surgeons have come to recognise that the stomach may be the mouthpiece of many abdominal organs and that an operation on a dyspeptic patient must in many cases be an exploratory one to find the cause, be it in stomach, duodenum, appendix, colon, or gall-bladder, the operation of gastro-enterostomy being never predetermined but used

solely when the definite indications are visible to the surgeon's eyes, disappointments have become more and more exceptional. Further, it is now fully recognised that for the ordinary callous ulcer of the lesser curvature of the stomach a gastro-enterostomy must be supplemented by some other measure, such as excision or cauterisation of the ulcer or a temporary jejunostomy, if lasting benefit is to be conferred.

Smithies examined 273 patients who returned either of their own accord or by request after gastro-enterostomy. They represented 11·6 per cent. of 2360 patients on whom the operation had been performed for gastric ulcer, duodenal ulcer, and cancer. He found that in 88 per cent. of the returning cases the patients had been improved by the operation but that in 216 cases there were still symptoms of dyspepsia. It is of interest to note that whilst in 226 of the returning cases the operation had been for gastric ulcer in only 35 had it been for duodenal ulcer. Of the total operations 571 had been for gastric and 1469 for duodenal ulcer, so that the percentage of cases returning was 39·6 gastric and only 2·4 duodenal.

The mistaken idea that gastro-enterostomy is primarily a drainage operation has led to its misuse in cases of large, flabby, atonic stomach, often with disastrous results, though an occasional success, particularly where the pylorus has been closed, has led some surgeons to persevere with its use. In such cases there is frequently a general visceroptosis and the performing of a short-circuiting operation has no rational basis and can only bring discredit on a most beneficent surgical procedure.

There remains however the 10 per cent. of disappointing cases, where the unfortunate sequel was due either to defects in the technique of the operation or to the development of a true jejunal ulcer.

The posterior no-loop operation has proved less liable to complications than any other, yet with it subsequent trouble may still arise if certain technical points are not observed. Moynihan summarises the technical defects which in his experience have led to distressing symptoms as follows:—

(1) Adhesions round the stoma leading to kinking, due to the division at the operation of an exaggerated ligament of Treitz leaving a raw surface.

(2) Rotation at the jejunal loop on its long axis in applying it to the stomach causing a subsequent kink.

(3) Too small an opening.

(4) The opening wrongly placed. It should be placed in line with the œsophagus. It might be added that the relation of the proximal loop of jejunum to the posterior wall of the stomach should be determined with the viscera *inside* the abdomen and the suitable site on the stomach for the anastomosis marked with a knife passed through the transverse meso-colon.

(5) Omission to suture the edge of the rent in the meso-colon to the stomach or to the suture line of the anastomosis, a hernia of small intestine occurring through the gap left.

(6) The use of unabsorbable suture material which later ulcerates out. Moynihan now uses very fine chromic catgut for both layers.

The development of true jejunal ulcer near the anastomosis, although infrequent, is still a problem beyond the control of the surgeon. Possibly the risk may be minimised by encouraging a more careful dietetic and antacid after-treatment than is usually followed in such cases.

When all is said, the fact remains that for the individual with an ulcer or stenosis in the pyloro-duodenal region the operation of gastro-enterostomy is the safest and surest means of obtaining lasting relief.

Gastric Carcinoma.

Although the early diagnosis of cancer of the stomach still leaves much to be desired, it is reported from various clinics that since doubtful gastric cases in patients of cancer age have been systematically examined by X-rays after a bismuth meal the number of operable cases transferred to the surgeon has increased appreciably.

A review of the late results after partial gastrectomy for carcinoma gives the encouraging conclusion that the radical operation is more successful than was at one time supposed.

An analysis of the cases of resection of the stomach for cancer in the Mayo clinic over a period of ten years gave the following results. Of 427 patients who recovered from the operation over three years before the inquiry 311 were traced. Of these 120 were alive and well. Of 313 patients who recovered from the operation five years before 239 were traced and 62 of these were alive. It was found that 106 patients were alive and well after periods of from six to fifteen years after operation.

So impressed was W. J. Mayo [14] with the favourable results after resection that he now frequently resects the growth in cases where it is impossible to remove all the glands and indurated tissue. In many cases the results after such an operation are surprisingly favourable. The observations of Thalheimer and Wilensky [15] on the spread of gastric carcinoma show that it is very rare to find any microscopic evidence of disease half an inch beyond the visible growth and support the view that resection is justifiable in extensive growths if the glandular metastasis is not too widespread.

As regards the operation itself Balfour's modification of the Polya operation, namely, the anastomosis of the cut end of the stomach to the side of a long jejunal loop brought up in front of the transverse colon,

is a distinct advance both in shortening the time of operation and in reducing the operative mortality. The complication of leakage from the duodenal stump is much less frequently encountered now that the simple method of ligature with catgut and generous invagination with a purse-string suture is more widely practised. The absence of rows of closely placed sutures reduces the menace to the blood supply of the stump which being somewhat precarious was frequently compromised to a dangerous degree by excessively careful suturing.

Where any doubt exists as to the reliability of the invagination Mayo advises the fixing of a portion of pancreas over the stump.

REFERENCES.—[1] Hartung, *Illinois Med. Journ.*, March 1918. [2] Baetjer and Friedenwald, *Johns Hopkins Hosp. Bull.*, August 1916, p. 221. [3] Boggs, *N.Y. Med. Journ.*, 1917, ii. 341. [4] Balfour, *Surg. Gyn. and Obstet.*, 1914, xix. 528. [5] Balfour, *Annals of Surg.*, June 1918. [6] Pauchet, *Bull et Mém. Soc. de chir. de Paris*, xlii. 1128. [7] Moynihan, *Brit. Med. Journ.* [8] Lewisohn, *Surg. Gyn. and Obst.*, xxii. 379. [9] Crile, *Journ. Amer. Med. Assoc.*, 1916, ii. 855. [10] Jacobson and Murphy, *ibid.*, 1917, i. 112. [11] Webb and Kinghorn, *Brit. Med. Journ.* (Epitome), August 14, 1915. [12] Wilensky, *Amer. Journ. of Med. Sci.*, June 1917. [13] Smithies, *Surg. Gyn. and Obstet.*, xxvi. 275. [14] Mayo, *Surg. Gyn. and Obstet*, April 1918. [15] Wilensky and Thalheimer, *Annals of Surg.*, 1917, p. 521.

RECENT WORK ON THE HEART.

By W. T. RITCHIE, M.D.

A FEW years ago we knew little about defective conductivity in the heart except that in the atrio-ventricular bundle. We recognised that this defect might be functional or organic; we knew that the conduction of stimuli through the bundle might be delayed, might be impaired so seriously as to cause partial block, or might be blocked completely. We were also familiar with the symptoms attending the various degrees of block in the bundle and with the structural changes or functional causes to which they were due. But we knew so little about conduction defects elsewhere, that the term "heart-block" was used synonymously with block in the atrio-ventricular bundle.

Within the last five years, however, defective conductivity or block in other parts of the heart has been receiving increasing attention, and we are now able to recognise sino-atrial (sino-auricular) block, bundle-branch block, and intra-ventricular block.

Sino-Atrial Block.—It is well known that each stimulus for the heart's contraction originates in the sinus node and thence passes to the atria and, through the atrio-ventricular node, the bundle, and its branches, to the ventricles. For many years it has been supposed that

the occurrence of dropped atrial beats, in an otherwise regular atrial rhythm, indicated, with a fair degree of certainty, a sino-atrial block. The dropping of beats did not necessarily denote a block, for the sinus node might have failed to initiate a stimulus, or the myocardium might have failed to respond to it; nevertheless the possibility of sino-atrial block had been considered by a number of writers. In 1916 Levine[5] reviewed the literature of the subject and recorded four new cases in which the heart occasionally stood still for a period equal to a multiple of the normal heart cycle. As there was no evidence of atrial activity during the pauses, it was inferred that the stimuli from the sinus node to the atria and to the ventricles were blocked.

The question may be asked under what circumstances does sino-atrial block occur and why is it so rare in comparison with atrio-ventricular block. The explanation is afforded by the experimental observations of Eyster and Meek.[2] They show that the normal contraction stimulus spreads from its origin in the sinus node to the right atrium directly, and to the atrio-ventricular node by a separate and diffuse path. If the latter path be interrupted one of two events may ensue. The stimuli may pass from the sinus to the atrio-ventricular node by way of the right atrium, or a nodal rhythm (atrio-ventricular rhythm) may develop. Moreover, if the normal path of conduction from the sinus node to the right atrium is blocked, the latter may still receive stimuli from the sinus node through the sino-ventricular path. Thus the abolition of one path leads to the utilisation of the other. This, together with the relatively high automaticity of the atrio-ventricular node, explains the rarity of sino-atrial block. Even in experiments it is difficult to induce sino-atrial block. In only one experiment did Eyster and Meek succeed in producing it. They indicate that sino-atrial block in the human heart postulates either an extensive lesion around the sinus node, or a widespread and marked functional defect of conductivity in the same area of the atrial wall. In this connection it is of interest to note that sino-atrial block is, in the majority of clinical cases, probably of functional origin, as it has usually been observed only when the patients were under the influence of digitalis, a drug which is known to depress conductivity in the atria. An organic lesion can seldom be so extensive as to cut all connections between the sinus node and the right atrium without being so widespread through the atrial wall as to cause fibrillation. Consequently sino-atrial block can seldom be due to organic disease. It is true that myocarditis frequently affects the atrial walls, and is a common cause of fibrillation, but a destructive lesion localised to the region of the sinus node has not yet been recorded.

Intra-Ventricular Block is now recognised as not uncommon and as a disorder of great gravity. The abnormal ventricular complexes, after

division of the right and left branches of the bundle, were described in 1910, and since then many clinical records have been obtained by Mathewson,[10] Carter,[1] and other observers which showed a right or a left bundle-branch block. In electrocardiograms, which are necessary for diagnosis, each ventricular complex is diphasic and resembles that of a ventricular extrasystole. The block is usually in the right branch, probably because of its long, slender form, and the ventricular complex resembles that of a left-sided ventricular extrasystole.

It soon became evident that the condition termed bundle-branch block was not necessarily due to an organic lesion severing a branch of the bundle. Experimentally it was shown that the disorder might be due to vagal stimulation, and in 1915 F. N. Wilson[20] demonstrated that the human heart under vagal stimulation might yield ventricular complexes characteristic of a block in the right branch. Attention was then drawn to other abnormal forms of ventricular complex characterised by prolongation of the QRS group of deflexions beyond the normal time of 0·1 second, by the gradual ascent and descent of the R deflexion, by its blunt, notched, or splintered apex, and by its diminished height. The QRS group occurs while the stimulus is passing through the branches of the atrio-ventricular bundle which lie mainly in the subendocardial layers of the ventricular muscle, and the ventricles have not yet begun to contract. It is therefore evident that abnormality in form of the QRS group suggests some disturbance of conduction in the terminal arborisations of the bundle within the ventricular muscle. The disorder is consequently spoken of as intra-ventricular, or arborisation, block. The abnormality of the ventricular complex indicates not merely a delay in the conduction of the stimulus through the arborisation but also a transmission through unusual and aberrant channels.

Oppenheimer and Rothschild[11] pointed out that post-mortem examination of cases diagnosed electrocardiographically as bundle-branch block has usually failed to show any definite lesion of the larger branches. The lesions, they state, are usually found in the lower third of the septum and involve the arborisation of the bundle in the wall of the left ventricle. In thirteen of their fourteen post-mortems they found a widely disseminated and patchy sclerosis of the myocardium, predominating in the endocardial and subendocardial layers. They also found in some instances sclerosis of the coronary arteries with or without occlusion of the anterior descending branch of the left coronary which supplies the anterior part of the septum. According to Willius,[19] intra-ventricular block is due to chronic myocarditis with fibrosis and fatty degeneration involving the subendocardial myocardium. The condition is observed most often in the sixth and seventh decades, and more often in men than in women. The patients present the clinical

features of cardiovascular renal disease, arterial sclerosis, myocarditis, or angina pectoris. According to Willius, the chief feature is that of myocardial failure, namely dyspnœa on exertion (100 per cent.) orthopnœa (22 per cent.), palpitation (34 per cent.), dropsy (30 per cent.), and angina pectoris (15 per cent.). The dropsy is seldom widespread. The heart is enlarged and its sounds are muffled, with lack of differentiation between the two sounds. Gallop rhythm may be heard, but it may develop apart from intra-ventricular block. The heart's rhythm is usually regular; the block is not necessarily associated with alternation of the pulse; and in only 15 per cent. of the patients are the atria fibrillating.

The clinical importance of intra-ventricular block lies in its grave prognostic significance. The average duration of life is only eight and a half months.

The Prognosis of Heart Disease is often notoriously difficult and fallacious. Patients in whom a grave valvular lesion is detected and whose death seems imminent may survive for years, whereas others who have presented no urgent symptoms may suddenly and unexpectedly develop extreme heart failure and die. From the classic writings we gain little assistance in determining the prognosis of any individual case. Even the voluminous literature of the last decade does not give much direct aid on this important question. Electrocardiology has hitherto been concerned mainly with diagnosis, and it is only of late that we have become able to appreciate correctly the true significance of some of the disturbances of the cardiac mechanism. Time had to elapse before their prognostic significance could be assessed with any degree of certainty. The gravity attaching to alternation of the pulse was recognised comparatively early. In Mackenzie's[9] experience alternation of the pulse is a very grave sign at all times, and especially in febrile affections. His teaching was confirmed by Windle,[22] who showed that in myocardial and arterial disease alternation always added to the gravity of the prognosis. Even in persons whose clinical condition is not apparently grave, alternation indicates heart failure, progressing inevitably to a fatal ending. Windle's cases of alternation usually died within a year; a few survived for two years. The question has again been studied by P. D. White.[17] Three years after examination he made inquiry regarding the patients' condition. While only 47 per cent. of patients with a wholly normal rhythm were known to have died, 74 per cent. of those with alternation were dead. The higher grades of alternation are almost twice as grave as the milder, for 91 per cent. of patients who had shown constant alternation, and 100 per cent. of those with marked alternation after extrasystoles, died within three years, as contrasted with only 57 per cent. of those with slight alternation after extrasystoles. These statistics indicate clearly

the gravity of alternation of the pulse. The only exception to this rule is the alternation associated with a pronounced tachycardia, at a rate of 140, 150, or more, as often occurs in atrial flutter. In such cases alternation is not necessarily of evil omen.

The prognosis of atrial fibrillation, according to White, is not so grave as that of the pulsus alternans. Of his fibrillation cases, 48 per cent. died within three years. While uncomplicated fibrillation has a surprisingly low mortality percentage (31 per cent.) the association of fibrillation with abnormal ventricular contractions is attended with a grave prognosis. Seventy-one per cent. of patients with fibrillation and ectopic ventricular beats, and 100 per cent. of those with fibrillation combined with intra-ventricular block, died within three years. In atrial fibrillation, these two forms of abnormal ventricular activity have the same grave significance as alternation has in patients with a normal rhythm.

The gravity of subendocardial myocarditis, with intra-ventricular block, is shown by the statistics of Oppenheimer and Rothschild [11] and of Willius.[19] The former state that of patients whose fate was known the mortality was 48 per cent. within two years. They contrast this mortality with that of twenty-two other patients who suffered from angina pectoris but did not present intra-ventricular block. Only one of these latter patients was known to have died: seventeen were alive, and sixteen were progressing favourably. The statistics given by Willius also prove how grave is the prognosis in cases of intra-ventricular block. He ascertained that 69·6 per cent. of all patients who had shown this form of block were dead; all except three having died of heart disease. The average duration of life from the time of examination was eight and a half months. Of 34 cases known to be alive, 17 were worse, 8 had improved, 9 reported no change. Intra-ventricular block is not only much more common than block in the higher parts of the atrio-ventricular conducting system, but is attended by a greater and an earlier mortality.

Cardiac Dyspnœa.—The association between dyspnœa and variations in the oxygen and carbon dioxide content of the blood has long been recognised, but clinical observations on this subject, with few exceptions, have been made upon the venous blood only. Systematic observations on the arterial blood did not begin until 1918, but it is now known that blood may be collected from the radial artery with ease and safety. Harrop [4] has determined the oxygen and carbon dioxide content of the arterial and of the venous blood in cases of heart disease. In those with good "compensation" and without arrhythmia no deviation from the values ascertained for normal persons was found. In these the average percentage oxygen saturation of the arterial blood is 95·5. The carbon dioxide content of the arterial blood

varies between 54·7 and 44·6 volumes per cent., that of the venous blood between 60·4 and 48·6 volumes per cent. In patients with failure of compensation, however, the percentage oxygen saturation of the arterial blood is abnormally low.

But the relation of cardiac dyspnœa to variations in the oxygen and carbon dioxide content of the blood is not altogether clear. In most patients the degree of dyspnœa, unless this be of toxic origin, is more or less parallel with that of the existing cyanosis, and recent research indicates no definite relation between cyanosis and the oxygen or the carbon dioxide content of the venous blood. Lundsgaard [8] states that cyanosis may be associated with low as well as with high values of carbon dioxide, while the primary cause of cyanosis in heart disease is an increase of the reduced hæmoglobin, or oxygen unsaturation, of the blood in the capillaries. He concludes that the mean capillary oxygen unsaturation, namely the mean between venous and arterial unsaturation, may be increased in two ways, either by an abnormally great reduction during passage through the capillaries, as in the retarded flow owing to heart failure, or by a state of partial reduction in the arterial blood entering the capillaries, as in certain pulmonary and cardiac diseases and particularly in mitral disease.

Attention is now being directed not only to variations in the blood gases but also to change in the alkalinity of the blood as a cause of cardiac dyspnœa. In health the hydrogen-ion concentration of the blood is constant and varies directly with the value of the ratio H_2CO_3 : $NaHCO_3$, which is normally 1 : 20. The free carbonic acid in the body fluids converts into bicarbonate all the bases not bound to other acids. The excess of bicarbonate represents the base available for the neutralisation of further acids, and is therefore known as the alkali reserve. The condition in which the concentration of bicarbonate in the blood is below normal is known as acidosis. It results either from excessive acid production or from its defective elimination. The constancy of the hydrogen-ion concentration of the blood is maintained by the carbonic acid and the bicarbonate. Whenever, either by increased production of carbonic acid or by decomposition of bicarbonate by acid, the ratio of H_2CO_3 : $NaHCO_3$ is increased, the hydrogen-ion concentration of the blood is proportionately increased and stimulates respiration until the carbonic acid concentration of the arterial blood is again reduced to one-twentieth of the bicarbonate.[15] All the methods of estimating acidosis depend, directly or indirectly, on the determination of the bicarbonate of the blood. Of the many methods, two are commonly employed, namely the estimation of the carbon dioxide content of the alveolar air (Plesch), or of the venous blood (Van Slyke).[14] The bicarbonate content of the serum or plasma can

also be determined by titration.[16] Whichever method we use, we are estimating the alkali reserve of the blood.

There is, as already indicated, a close relation between the alkali reserve and respiration. If the former be reduced, as by exercise or in disease, the breathing becomes faster and deeper in the attempt to lower the CO_2 concentration of the blood and to preserve its normal hydrogen-ion concentration. Now, it is a matter of common knowledge that the dyspnœa of many cardiac patients, especially if it be paroxysmal or if the respirations be periodic or frankly of the Cheyne-Stokes type, is not essentially due to cardiac failure but is of toxic origin, and is associated with defective renal excretion. Six years ago Lewis and his co-workers[7] focussed attention on the difference between the dyspnœa of uncomplicated heart disease, which might satisfactorily be explained by an excessive accumulation of carbon dioxide in the blood, and the dyspnœa, sometimes known as "uræmic dyspnœa" or "cardiac asthma," occurring in elderly persons with varying degrees of arterial and renal disease. It was found that the dyspnœa of the latter cases was associated with, and might be ascribed to, acidosis.

These observations have not been wholly confirmed by Peabody,[12] for he finds that the degree of acidosis in cardiac and cardio-renal patients is seldom great even when dyspnœa is pronounced. But even a moderate degree of acidosis in these patients renders them unduly susceptible to any further reduction of the alkali reserve. Thus a case of chronic nephritis may have no dyspnœa so long as the heart remains efficient, but when this fails and carbon dioxide accumulates in the blood this has a greater effect on respiration than in a person without any acidosis. A further distinction between the acidosis in cardiac and in renal patients is drawn by Whitney.[18] All his renal cases presented a marked acidosis in their later stages, whereas cardiac cases without renal involvement showed little acidosis, and then usually as a terminal event. In some cardiac patients the estimation of the blood carbonates was even abnormally high, particularly when cyanosis was marked. In cases of heart disease the dyspnœa of acidosis is not cardiac in origin but is due to faulty metabolism and failure of elimination. The contrast between the total creatinine content of the blood in cardiac and in renal patients[3] illustrates the difference between the two. In the former the creatinine metabolism is seldom abnormal, whereas in the latter the total creatinine in the blood is invariably too high.

In cases of heart failure, a lowered vital capacity may be a contributory factor in the production of acidosis and of dyspnœa. In patients with well-compensated heart disease, who do not complain of breathlessness, Peabody and Wentworth[13] found that the vital

capacity of the lungs, namely the volume of the greatest possible expiration after the deepest inspiration, was normal. Those in whom dyspnœa was a prominent symptom had a low vital capacity ; as they improve this tends to rise, as they become worse it tends to fall. The defective ventilation resulting from lowering of the vital capacity must necessarily tend to raise the hydrogen-ion concentration of the blood and therefore to increase the dyspnœa. In this connection mention may be made of the fact that in D.A.H., which is not primarily a cardiac disorder, the dyspnœa is not due to acidosis,[21] and the average vital capacity is only slightly reduced, the reduction being insufficient to account for the patients' breathlessness on exertion.[6]

The conclusion to which we come is that severe heart failure alone does not cause either excessive acid production or failure of its elimination, except as a terminal event. Acidosis is not the chief cause of dyspnœa in uncomplicated heart disease ; in cardio-renal cases acidosis is not the sole cause but it is a contributory factor, particularly in the later stages of the disease and when the kidneys are markedly involved. This is in harmony with well-established clinical facts. The dyspnœa of heart cases may be essentially renal in origin, and one of the first essentials in the treatment is not only to promote elimination by the kidneys but also to lessen the strain upon them, by modifying the diet and by furthering free elimination from the bowel.

References.—[1] Carter, E. P., *Arch. Int. Med.*, 1918, xxii. 331. [2] Eyster, J. A. E., and Meek, W. J., *ibid.*, 1916, xviii. 774 ; 1917, xix. 117. [3] Greenwald, I, and M'Guire, G., *Journ. Biol. Chem.*, 1918, xxxiv. 103. [4] Harrop, G. A., *Journ. Exper. Med.*, 1919, xxx. 241. [5] Levine, S. A., *Arch. Int. Med.*, 1917, xvii. 153. [6] Levine, S. A., and Wilson, F. N., *Heart*, 1919, vii. 53. [7] Lewis, T., Ryffel, J. H., Wolf, C. G. L., Cotton, T., and Barcroft, J., *Heart*, 1913-14, v. 45. [8] Lundsgaard, C., *Journ. Exper. Med.*, 1918, xxvii. 179, 199, 289 ; *ibid.*, 1919, xxx. 259. [9] Mackenzie, J., *Diseases of the Heart*, 1910, 191. [10] Mathewson, G. D., *Heart*, 1912-13, iv. 385. [11] Oppenheimer, B. S., and Rothschild, M. A., *Journ. Amer. Med. Assoc.*, 1917, lxix. 429. [12] Peabody, F. W., *Arch. Int. Med.*, 1915, xvi. 846. [13] Peabody, F. W., and Wentworth, J. A., *Arch. Int. Med.*, 1917, xx. 443. [14] Van Slyke, D. D., *Journ. Biol. Chem.*, 1917, xxx. 347. [15] Van Slyke, D. D., and Cullen, G. E., *ibid.*, 1917, xxx. 289. [16] Van Slyke, D. D., Stillman, E., and Cullen, G. E., *ibid.*, 1919, xxxviii. 167. [17] White, P. D., *Amer. Journ. Med. Sc.*, 1919, N.S., clvii. 5. [18] Whitney, J. L., *Arch. Int. Med.*, 1917, xx. 931. [19] Willius, F. A., *ibid.*, 1919, xxiii. 431. [20] Wilson, F. N., *ibid.*, 1915, xvi. 1008. [21] Wilson, F. N., Levine, S. A., and Edgar, A. B., *Heart*, 1919, vii. 62. [22] Windle, J. D., *Quart. Journ. Med.*, 1913, vi. 453.

TRANSFUSION OF BLOOD.

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WITHIN recent years there has been an increasing tendency to employ transfusion of blood as a therapeutic measure. The war provided ample opportunity for observation of the different methods and of gauging its results. It would appear that a distinct impetus has been given to the use of the procedure in cases of disease such as anæmia as well as in cases of severe hæmorrhage. Numerous articles dealing with the subject have appeared in recent American literature.

Bernheim [1] relates his war experience. His report is mainly of surgical interest but his forcibly expressed views are of importance in a wider field. He points out that, in spite of records of brilliant advances of knowledge and reports of lives saved by transfusion, there still exists a scepticism not only as to its efficacy but also as to its need.

"How often have we been told that it is the rarest thing for a patient to bleed to death! The woman suffering from ruptured ectopic gestation never passes away from loss of blood; the bleeding gastric ulcer never bleeds till actual exitus. The torn vessels of a mangled limb always become twisted and plugged; so bleeding from it ceases. And after all, so we are told, a salt infusion or a gum infusion is all that is needed—urgent cases may, perhaps, demand the introduction of the solution by way of the veins. But, in either event, they will do all that blood will do. Would that this were so! The number of American dead populating French cemeteries would be reduced considerably, and the feeling of animosity toward those responsible for the ill-directed, albeit sincere, efforts to introduce gum solution into the treatment of hæmorrhage and shock in the battle-wounded would be less keen."

The theory underlying the introduction of gum is that the solution possesses all the advantages of salt solution for combating shock and refilling blood-vessels emptied as a result of hæmorrhage, and, further, that it has the power of sustaining a rise in blood-pressure and of remaining within the confines of the vessels.

Were this true, gum solutions would have been of untold value in the treatment of wounded men. Bernheim expresses the view that overwhelming evidence against the use of gum solution was not sufficient to cause its abandonment and regrets that failures only seemed to stimulate futile efforts to improve the method. During war there was no time for experiment, and had half the energy and time spent on gum solution been concentrated on salt solution and blood

transfusion, the efficacy and the limitations of which were already known, there would have been much more to show for the effort.

Several remarkable recoveries after hæmorrhage and blood transfusion are quoted. In the anæmias secondary to battle wounds blood transfusion was found to be of the greatest value.

In view of its simplicity and elasticity the sodium citrate method is regarded as the procedure of election.

Lindeman [2] combats the view that the citrate method is the best procedure. He lays down the following postulates:—

(1) The method must be applicable in any case and in any disease. (2) It must be possible to transfuse any amount necessary to obtain the most desirable clinical results. (3) The blood must be transfused exactly as it exists in the donor. (4) It must pass through a minimum of foreign material. (5) It must be out of the body of the donor and into that of the patient in a minimum length of time. (6) It must be free of reactions.

There are at least four classes of reactions to be recognised in blood transfusions.

These are hæmolysis and agglutination, toxic substances developed in the blood on remaining outside of the body, chemicals such as anticoagulants and physiological saline solution, and sensitisation and anaphylaxis. By careful supervision of the laboratory tests a reduction in the proportion of cases of febrile reaction was effected. A small proportion amounting to 9 per cent. of reactions remained. An improved technique including the elimination of sodium chloride and the use of a cannula and syringe has enabled Lindeman to obtain 214 consecutive results without any severe reaction.

The cases include 31 of pernicious anæmia, 14 of hæmorrhage, and 45 miscellaneous. Of these groups the cases of pernicious anæmia showed the highest proportion of post-transfusion rise of temperature. The author is, however, inclined to believe that this was due to the fact that the pernicious anæmia cases received larger amounts of blood than the others. A considerable amount of discussion centres round the question of the effect of substances added to the blood, and it is pointed out that the clinical results of a single injection of sodium citrate into the circulation of an individual is by no means any proof of its harmlessness when added to blood outside of the body. While adding citrate, it is possible for the bodily mechanism to neutralise or convert it before any injury has been done to the blood itself. On the other hand, when chemicals are added to so labile a substance as blood, and the blood is allowed to stand outside the body for from twenty minutes to several hours, a wholly different set of circumstances may obtain. The conclusion is reached that citrate of soda produces changes in the blood or, by its presence, allows changes to occur which produce reaction and

toxic symptoms. Further, the method limits the amount which it is possible to give but also predisposes the patient to danger of sensitisation for subsequent transfusions by the introduction of toxic substances. The subsequent introduction of toxic substances may induce bronchiospasm, angioneurotic œdema which may be generalised and lead to death, and rigors and fever are more common. These results do not follow the use of repeated doses of unmodified blood by the syringe-cannula method.

Novy and De Kruif [3] show that toxic substances develop in blood on standing for three minutes. They examine the nature of the toxic substances in some detail, and find an anaphylotoxin in the plasma and serum. Almost any foreign substance, such as bacteria, organ extracts, peptone agar, and salts, when added to serum may determine the presence of toxins.

Drinker and Brittingham [4] and Clowes, [5] among others, report adversely on the use of the citrate method as compared with the employment of unmodified blood.

Unger,[6] while not so emphatic on the point, prefers unmodified blood to the citrate method. When standard sera are not available and when donors are not classified according to the group to which their blood belongs, Unger uses the following simplification of the method of Rous and Turner.

"In a pipette used for counting leucocytes, one part of 10 per cent. sodium citrate and ten parts of the patient's blood are mixed. A similar specimen of the donor's blood is collected. From these specimens, by means of a third pipette, are mixed nine parts of the donor's blood to one part of the patient's, and also one part of the donor's to nine parts of the patient's. A drop of each of these mixtures is put on a slide, a drop of physiological sodium chloride solution is added, a cover-glass is applied, and examination is made under the microscope. Any clumping, not rouleau formation, is agglutination, and this donor should not be used. Usually the clumping appears immediately, but it is wise to observe the mixture for fifteen minutes."

It is recognised that a serum which causes agglutination of corpuscles is likely to cause hæmolysis.

Unger gives the following indications for transfusion: (1) Hæmorrhage, (2) diseases of the blood, (3) toxæmias, (4) infections, (5) shock, and (6) general debility.

1. *Hæmorrhage* is the outstanding indication. Transfusion serves not only to replace loss of blood but also to check bleeding. In about 85 per cent. of cases of acute hæmorrhage, bleeding can be stopped by a single transfusion. In this connection we note the report by Lowenburg [7] of a case of bleeding from the nose, mouth, and rectum in an infant two days old. Blood was injected directly into the longitudinal

sinus *via* the posterior angle of the anterior fontanelle. During the operation artificial respiration was necessary. A good recovery followed, the hæmoglobin rising from 20 to 80 per cent. in less than a month.

2. *Diseases of the Blood.*—In secondary anæmia the results are satisfactory, provided the primary cause is removed. In pernicious anæmia transfusion yields results superior to any other method of therapy. Frequently it acts as a life-saving measure by initiating the onset of a remission. There is no evidence, however, that the disease can be permanently cured in this way. Nevertheless, by repeated transfusions, remissions can be effected and the lives of some patients made useful for years. In such cases the same donor should, if possible, be successively employed. The amount of blood does not seem to be the determining point of the remission. Small amounts have sometimes been of as much value as large amounts. In none of Unger's cases has transfusion led to an increased secretion of hydrochloric acid by the stomach. If transfusion is repeated because a first one failed to bring about a remission, a different donor should be employed. Hæmophilia is not cured by transfusion, but for the actual bleeding it is practically a specific. It often succeeds when all other methods fail and too much time should therefore not be lost in trying other measures. Transfusion both controls the hæmorrhage and replaces the lost blood.

In purpura hæmorrhagica the results of transfusion are only fairly good.

In acute lymphatic leukæmia only a temporary favourable effect can be secured.

In bleeding of the new-born, transfusion is a specific. Temporising with subcutaneous injections of blood or serum may cost the infant its life. This is especially true in cases of melæna neonatorum.

3. *Toxæmia.*—Information under this heading is not very definite. Unger's position seems more that of a pleader for extended trial rather than a convinced advocate. The conditions which he specifies are toxæmia of pregnancy and acute infections such as pneumonia and typhoid fever. Owing to the apparent potency of the measure as a hæmostatic and the danger of intracardiac coagulation in pneumonia one would be very chary of attempting transfusion in that disease. From blood-letting to transfusion is surely the maximum swing of the therapeutic pendulum !

4. *Infections.*—In localised pyogenic infections we are boldly informed that transfusion will increase the patient's vitality and aid in overcoming infection.

In bacteriæmia where the source of the organisms can be found and eliminated, as in cases of sinus thrombosis, the results are excellent. We might here inquire whether the excellence is due to the elimina-

tion of the source of the poison or to the transfusion. Only one case of puerperal sepsis out of twenty recovered.

5. *Shock.*—Transfusion is sometimes of service and should be carried out as early as possible.

6. *General Debility.*—We are told that transfusion should be used as a preliminary to operations as a supporting measure and thus diminish post-operative mortality. In conditions such as inoperable cancer and pemphigus, transfusion will improve the patients' general condition and prolong life. The danger of hypertransfusion is referred to. Its onset is signified by the patient giving vent to short, sharp coughs. The giving of more than 200 c.c. of blood after the occurrence of this "signal cough" may prove fatal. The usual adult dose of blood is 800 to 1000 c.c.

Unger's paper contains an interesting note on the effect of repeated transfusion on the donor. He has had the opportunity of observing the professional donors who repeatedly give blood in New York.

After a single transfusion the donor has a moderate secondary anæmia which is rapidly recovered from. After repeated transfusions the anæmia may be severe and recovery may take months. The case is quoted of a donor who underwent sixty transfusions in six and a half years. He gave during that time 50,000 c.c. of blood, or ten times his blood volume. He had received $1700 in fees. During the six and a half years he gained weight. Nine weeks after his last transfusion his hæmoglobin was 70 per cent., otherwise he seemed in good health. Even severe anæmia from donations is recovered from, if sufficient time be allowed to elapse. This is a point of importance, since in pernicious anæmia remissions are sometimes determined by a certain donor when others fail.

Lindeman,[8] in a paper later than that already noticed, takes up the position that blood transfusion may favourably influence the course of many diseases other than hæmorrhage and anæmia.

In long-standing cases of sepsis there may be a varying degree of anæmia, malaise, debility, and poor nutrition. These persist for a long time and the issue may be for long in doubt. Even in cases where blood cultures gave positive results transfusion is indicated and may prove of great service.

Transfusion led to apparent cure in four cases of tropical sprue. Something more than mere improvement in the anæmia was regarded as responsible for the arrest of the disease. Poisoning by illuminating gas is an obvious indication for transfusion and an illustrative case is quoted. A case of acne which had persisted for twelve years cleared up after three transfusions. Cases of nephritis at a critical stage are often benefited by this method.

Some of the claims made are possibly exaggerated, but the position

seems definitely reached that transfusion is the outstanding measure for dealing with the results of hæmorrhage. It may arrest bleeding. It is of great service in anæmia and frequently determines a remission, even in pernicious anæmia. Beyond all this, there is evidence that transfusion may be of service in a wide sphere of general disease, and present knowledge justifies the further exploration of that field.

The preponderance of opinion is in favour of unmodified blood rather than of the citrate method.

REFERENCES.—[1] Bernheim, *Journ. Amer. Med. Assoc.*, lxxiii., 19th July 1919. [2] Lindeman, *Journ. Amer. Med. Assoc.*, lxxii., 7th June 1919. [3] Novy and De Kruif, *Journ. Amer. Med. Assoc.*, lxviii., 26th May 1917. [4] Drinker and Brittingham, *Arch. Int. Med.*, xxiii., February 1919. [5] Clowes, *Journ. Phys. Chem.*, xx., 1916. [6] Unger, *Journ. Amer. Med. Assoc.*, xiii., 13th September 1917. [7] Lowenburg, *Journ. Amer. Med. Assoc.*, lxxii., 31st May 1919. [8] Lindeman, *Journ. Amer. Med. Assoc.*, lxxiii., 20th September 1919.

NEW BOOKS.

Cerebro-Spinal Fever. By C. Worster-Drought, M.A., M.B.(Cantab.), and Alex. Mills Kennedy, M.D.(Glasg.). With 62 Illustrations. Pp. xxii + 514. London: A. & C. Black, Ltd. 1919. Price 30s. net.

Not a few monographs on this interesting disease have been published in the last ten years and it would be natural enough to question the necessity of the publication of another. But we may say at once that the contents of this volume entirely justify the authors, and that this work will be read with profit by all interested in the subject. They have not only summarised very ably and succinctly the great mass of literature on cerebro-spinal meningitis which has been called forth by the prevalence of the disease during the war, but they have also, as the result of a very extensive personal experience of the clinical and bacteriological features of the fever, made a most important contribution to that literature. Every chapter bears evidence of the thoroughness of their work and the accuracy of their observation. Short histories of especially interesting cases illustrate the most important points and these are not the least instructive part of the book. The chapter on the cerebro-spinal fluid and on the various chemical tests strikes us as particularly good. The authors obviously have more confidence in the value of testing for glucose than have many writers, and in this we are entirely in accord with them. We note also that they hold the view that the preliminary catarrh, which has been observed occasionally, though perhaps not so commonly as some would have us believe, is not a stage of the disease itself although it may doubtless predispose to infection. The authors prefer lumbar puncture in the middle line, which is of course the simplest method, but they differ from many of us in puncturing without anæsthesia. But whatever methods or views they adopt they are throughout careful to give the reasons for their preference. We doubt very much if the elaborate precautions against infection recommended for nurses and visitors are necessary. Infection in properly ventilated wards with liberal floor-space, must be extremely rare. The difficult subject of the treatment of carriers is adequately discussed, and the authors have had impressive results with the chloramine spray, some of their cases appearing to prove the value of this disinfectant beyond question. The reader finishes the volume with the impression that it is an eminently safe and practical guide for the treatment and management of the fever. The book itself is well printed and the illustrations and charts are interesting and helpful. We most cordially congratulate the authors.

Injuries to the Head and Neck. By Captain H. Lawson Whale, R.A.M.C.(T.F.). Pp. x + 322. With 130 Illustrations. London: Baillière, Tindall & Cox. 1919. Price 15s. net.

Captain Whale is, to use his own words, an oto-rhino-laryngologist, who by happy chance was in the great war associated with the department of oral surgery at the base hospital at Boulogne, and afterwards with the Queen's Hospital at Sidcup for jaw and facial injuries. It is fortunate that experience of such extent and variety fell to the lot of an officer who proves himself in this book an acute observer, a careful recorder, and a surgeon who, while a master of special technique, is ever mindful of the fundamental principles on which all successful surgery is based. He begins with hæmorrhage and extraction of foreign bodies. Here and in his consideration of neck wounds, their complications and treatment, we find observations interesting and valuable. Writing of septic pneumonia, which he calls "the surgeon's bogey," he remarks that for a long time in France it was the rule rather than the exception for patients with jaw or face wounds to be "chesty" from the moment of admission, a large proportion showing physical signs of bronchitis or broncho-pneumonia on admission or within forty-eight hours. For operation on these cases he considers chloroform the anæsthetic of choice. It is curious to note that in over 600 admissions to the jaw centre in Edinburgh no single cases of septic pneumonia occurred, though many patients arrived within forty-eight hours of receiving their wounds. We can confirm his statement that to overcome buccal and salivary fistulæ is not so formidable a procedure as would be supposed. There is thoughtful and illuminative matter in the chapters dealing with the larynx, ear, nose, and accessory sinuses. The general and special principles of treatment are clearly laid down, and cases presenting usual and unusual features are well described.

Rhinoplasty is very fully dealt with; in fact we regard Captain Whale's account of the plastic restoration of the nose as the best *résumé* of present-day practice yet written. In treating of facial injuries he points out that modern plastic facial surgery opens up a new field, that the war has exalted its quality and introduced many effective refinements.

The important question of primary suture of severe facial wounds is debated with conspicuous fairness, and we are left with the impression that the author's preference (which we share) is that while entirely to abstain from sewing up the wound at a field ambulance or casualty clearing station is wrong, no reformation should be attempted there: the surgeon should be content to bring the parts together, and save as much tissue as possible without endangering its vitality by shutting in septic areas. It is only too true that the work of the surgeon at the base has often been made much more difficult by

premature efforts to close the wound and restore the parts. General principles are well enunciated. The technique of skin grafts and of pedicled grafts, sliding, rotated, and translated is described with care and lucidity. The illustrations of this section are excellent. Injuries of the jaws have three chapters devoted to them. The fact that the help of the prosthetist has become an integral part of the treatment of these injuries is generously recognized. It is evident that Captain Whale regards bone-grafting as the most important advance in the purely surgical treatment, and in the last chapter he explains and illustrates the various methods of bone-grafting the mandible. Rectal ether-oil is advised as the anæsthetic. This chapter is an admirable exposition of up-to-date practice of the operation in question.

This is a well-written, well-illustrated, well-produced book, which will be of extreme interest to military surgeons.

Diseases of Women. By Ten Teachers. Edited by COMYNS BERKELEY, H. RUSSELL ANDREWS, J. S. FAIRBAIRN. Pp. xii + 650. With 8 Coloured Plates and 238 Figures. London: Edward Arnold. 1919. Price 30s. net.

THIS book is the work of ten writers and it thus marks a novelty in the production of text-books. The chapters are each written by one teacher and then submitted to the rest of the circle for comment and alteration.

The result is that it loses some of the advantages which a text-book written by a single author of proved experience and ability possesses. It has lost the character which the individual touch and personality alone can give. On the other hand it possesses some points which make for improvement in teaching. The combination of effort and criticism has resulted in a breadth and sanity of outlook, and a balance possessed by few text-books, and in a ruling out of much teaching that rested on nothing but tradition.

The chapters are well written and are always lucid. Some reach a very high standard, for example, that on "Menstrual Pain" and that on "Chronic Corporeal Endometritis." In the case of chronic endometritis the etiology is given simply as an infective process, and in this way the usual confusion that envelops the subject is avoided.

There are some omissions worthy of note. For instance there is no description of the histological changes in menstruation, and elongation of the cervix, which is a distinct pathological entity, receives no notice except a passing reference in the discussion of the differential diagnosis of prolapse. There is no illustration showing a transverse section of the Fallopian tube.

The book is well got up and the illustrations are good. It is bound to take a high place amongst text-books on gynecology.

Sterility in Women. By ARTHUR E. GILES. Pp. xv + 227. With 11 Illustrations. London: Henry Frowde and Hodder & Stoughton. 1919. Price 10s. net.

THIS book is an exhaustive study of sterility based partly on the literature and partly on the case-books of the author.

The importance of the male factor is emphasised. The author places it at somewhere between 10 per cent. and 50 per cent. The wife should not be assumed to be responsible in doubtful cases in the absence of definite evidence that the husband is healthy. In testing the male potency it should be remembered that spermatozoa are killed as a rule within a hour in the vagina. The smear must be taken from the cervix direct.

The proportion of sterile marriages in this country is given as approximately 10 per cent. for the working and 16 per cent. for the leisured classes. The important causes operate as follows: anteflexion, 24 per cent.; tubal disease, 11 per cent.; endometritis, 10 per cent.; retroversion (and retroflexion), 10 per cent.; ovarian tumours, 6 per cent.; vaginismus, 4·5 per cent.

There is an interesting discussion on the relation between fibroids and sterility, the author believing that the sterility is the cause of the fibroid growth. In support of this he brings out that "in 85 per cent. of cases of fibroids the patient either has not been pregnant at all, or has had no pregnancy for at least ten years."

The book is of great value and its appearance is especially opportune at this time.

A Vision of the Possible: What the R.A.M.C. might become. By Sir JAMES W. BARRETT, K.B.E., C.B., C.M.G., M.D., F.R.C.S. Pp. xx + 182. Illustrated. London: H. K. Lewis & Co., Ltd. Price 9s. net.

A perusal of this interesting book gives the impression, to a reader familiar with the R.A.M.C. of the pre-war days, that the author has failed to see the wood for the trees. He confesses that he knows little of R.A.M.C. organisation before the war, but sets forth a vision of reformation.

It is unfortunate that a work of this description is apt to be misconstrued by the general reader, and when it is hinted that, after reformation, the R.A.M.C. may become a force of which the nation may be justly proud, it would appear that all the facts have not received their due consideration. Like many—one might safely say a great many—civilians who were drawn into military service, the author looks at army methods and army training through glasses which cut off the all-important rays which elucidate the principles essential to military medical efficiency. Military efficiency is the be-all and end-all

of an army. The object of an army is to fight, and to fight better than the enemy, and, in a word, to beat him. The commander has many resources at his disposal for this purpose, and the medical service is one of these, and, as facts have proved again and again, a no small or unimportant one. One, too, of which the army and the nation may be, and let us hope are, justly proud. The R.A.M.C. has been evolved on lines calculated to bring about the smooth and efficient working of the fighting force, and in the book under review it does not appear that the author definitely grasps that fact.

To a certain extent he disarms criticism by his friendly references to individual officers, but the questions of rank and promotion, and their close association with discipline and the maintenance of army organisation as a whole, are sadly befogged by a mass of details—details which go to reveal the existence of a lack of professional acumen, a not surprising deficiency in uniformity of professional opinion, and various other matters for which responsibility can scarcely be fixed upon the Army Medical Service.

In the face of the fact that the nation is discussing and considering State Medical Service, with officials, and regulations, and, let us hope, discipline, it is scarcely fair to ask whether the Army Medical Service is ever appealed to for professional guidance by the non-military side of the profession.

One might say much more, one might express opinions as to whether the introduction of civilian specialists in the various branches of medicine and surgery, with their very natural tendency to magnify their particular office, was an asset of indubitable military value—whether it did not tend to put research and therapeutics before the Art of War—or again, how the sense of perspective in regard to the various functions of a medical officer has been lost—but space forbids.

The book will be read with interest and advantage by the Service, but the vision of the future for the officers and men of the Royal Army Medical Corps will be that of an intelligent extension and consolidation of the pre-war organisation, with the main objective of maintaining its position as an integral and vital part of the British Army, and "their reward shall be a betterment of the Service in the interests of the nation, in the interests of its officers, and, indeed, in the interests of the Science of Medicine."

United States Army X-ray Manual. Authorised by the Surgeon-General of the Army. Pp. 506. With 219 Illustrations. London: H. K. Lewis & Co., Ltd. 1919. Price 18s. net.

THIS manual is primarily designed as a guide to radiologists working in U.S. military hospitals.

The first quarter of the manual is devoted to X-ray physics.

Fundamental principles are briefly but clearly explained, and the notes on the physical aspects of the apparatus employed are likely to be useful to the student of radiology, whether military or civilian. The general technique described is founded on the use of the Coolidge tube and X-ray transformer, as such apparatus forms part of the standard U.S. Army X-ray outfit. A section of eighty pages is devoted to localisation of foreign bodies. Fluoroscopic methods are preferred, and little reference is made to the stereoscope.

Under the heading of "Bones and Joints" there is much useful information, particularly some remarks on examination of the spine and abnormalities of the spine. Considerable attention is given to the differentiation of appearances presented by plates of various tumours of the long bones and also of various forms of arthritis. Separate sections are devoted to "Sinuses and Mastoids," "Thoracic Viscera," and "Gastro-Intestinal Tract." The manual is a convenient size, is well printed and the illustrations are good.

A Treatise on Orthopædic Surgery. By ROYAL WHITMAN, M.D., M.R.C.S., F.A.C.S. Sixth Edition. Pp. 914. With 767 Illustrations. London: Henry Kimpton. 1919. Price 36s. net.

THOUGH for many years orthopædic surgery has been gaining a more prominent place in general surgery, at no time has it received such an impetus as during the recent war. The numerous deformities due to bone and joint injuries, nerve lesions, and muscle destruction caused by warfare, have stimulated anew the study of this subject. The works of pioneers, such as Owen Thomas, have been read again, and the experience of civil practice reviewed with the object of finding solutions to the many difficult problems now presented. The revised edition of Royal Whitman's text-book, a book which has for many years been regarded as a standard work on orthopædic surgery, is therefore specially opportune.

The treatise is primarily written for general practitioners. The various conditions are dealt with according to their relative frequency and importance. Thus, such subjects as Pott's disease, tuberculous arthritis of the hip, knee, and elbow, and congenital and acquired deformities of the foot are considered in great detail. Particular attention is paid to early symptoms and prophylaxis. Rarer deformities are more briefly dealt with.

A special feature of the sixth edition is the addition of a chapter on military orthopædics. A short account is given of the more important appliances used in the treatment of fractures, the methods of bone grafting, nerve suture, and nerve transposition and of Vanghetti's

kineplastic amputations. Though not so authoritative nor so free from error as other chapters, it is nevertheless a useful epitome of orthopædic surgery as applied in the recent war.

The book is amply illustrated. Throughout the subject is presented in a clear and comprehensive manner. This is a treatise that can be confidently recommended to practitioners and students either as a work of reference or for general perusal.

Heart: Past and Present. By Edgar Lea, M.D., M.R.C.P. Pp. viii + 300. London: Baillière, Tindall & Cox. 1919. Price 7s. 6d. net.

The first part of this book contains a brief historical sketch in which the contribution made to our present knowledge by the physiologist, the pathologist, and the clinician is examined with a view to finding a clue to paths of advance in the future. The second part deals with the present state of cardiology. The view emphasised is that, at present, the best guide to a just estimate of cardiac efficiency is to be found in a study of the patient's subjective symptoms, and that the import of the objective signs is to be judged in the light of these subjective phenomena. Certain syndromes combining subjective and objective evidence are suggested for recognition as clinical entities with the object of putting the study of symptomatology upon a sounder basis and furnishing more reliable indications for a rational prognosis. This is a thoughtful and suggestive study welcome to all who have at heart the future of this branch of medicine.

The Nervous Heart. By R. M. Wilson and J. H. Carroll. Pp. 136. With 55 Figures. London: Henry Frowde and Hodder & Stoughton. 1919. Price 6s. net.

In this interesting study of functional heart disease the importance of the nervous mechanisms controlling the circulation is rightly insisted upon. Dominance of vagus depressor action tends to the accumulation of the blood in the abdomen, skin, and lungs. Dominance of sympathetic pressor action tends to constrict these vascular areas with consequent distribution of the blood to the muscles and to the brain. Adequate sympathetic response to the opposing vagus action is thus a necessity for efficient action, muscular or mental. In cases of "functional heart disease" the vagus depressor mechanism is rendered hyperexcitable by toxic action, and to compensate for this the sympathetic system becomes over-active also. In this way is explained the thyroid enlargement seen in some of these cases, and, as the authors have found that administration of thyroid extract instead of aggravating the symptoms tends to relieve them, their interpretation seems

justified. Originally concerned with cases of trench fever, the authors have found similar hyperexcitability of the nervous circulatory mechanisms in other conditions, including rheumatism and rheumatoid arthritis.

It is to such intelligent clinical observation and deduction as is displayed in this work that we may confidently look for further advances in our knowledge of a very complex subject.

Practical Vaccine Treatment for the General Practitioner. By R. W. Allen, M.A., M.D., B.S., late Captain N.Z.M.C. Pp. xii + 308. London: H. K. Lewis & Co., Ltd. Price 7s. 6d. net.

Dr. Allen's pioneer work in the domain of vaccine therapy is already well known and justly esteemed. His most important contribution has probably been his advocacy of the practical value of focal reactions as a guide to dosage. It may be said that, on the whole, this book fulfils its purpose of a guide to the general practitioner, but it is certainly less complete than it purports to be. The author rather unfortunately gives the impression that he regards therapeutic immunisation as an applied science that has nearly reached its full development, whereas it is really still in its infancy. He does not deal with the methods of bacteriological analysis, but refers to the subject in such a way that many will be led to believe that the making of an analysis of this kind is a simple matter, whereas, if information sufficiently complete to be of real value is to be obtained, it is generally a most laborious and time-absorbing task. The doctor is frequently advised to have an autogenous vaccine made, without due regard to the facts that he himself has neither the time nor the special training necessary, and that laboratories of the kind required can hardly be said to exist, or are at least ridiculously few in number, or too far away. The practitioner will be left with the feeling that he must depend upon stock vaccines, and it cannot be said that the book gives him adequate advice as to the limits within which their use is legitimate. The reader will nevertheless find it a mine of authoritative and helpful information that is sure to impress him with the growing importance of therapeutic immunisation.

The Nervous Child. By Hector Charles Cameron, M.D. Pp. viii + 202. London: Henry Frowde and Hodder & Stoughton. 1919. Price 6s. net.

This is a most refreshing and suggestive little book. We all know now, unfortunately, how much neurosis and hysteria was manufactured by treatment in military hospitals and convalescent homes—by the application of supports to functional palsies, by excessive

sympathy, and by exhaustive clinical examination; we also know, in a general way, that the children of sensible mothers are usually healthier and freer from minor ailments than those whose mothers are highly strung and excitable, but the application of this knowledge is not so common. Here Dr. Cameron tells us how it should be used, and in doing so has made a useful contribution to preventive medicine. His thesis, roughly, is that if an infant or young child is fussed over—if undue stress is paid to any passing functional abnormality,—the subject's attention will be fixed on it, and it will tend to be perpetuated. If, on the other hand, a "don't care" frame of mind be adopted, the child will in all probability not form a habit of what is in essence merely a transitory disturbance or a whim. Dr. Cameron is a close observer of children, and understands their psychology, and his remarks on "negativism" and on suggestibility are very much to the point. Among the specific neuroses dealt are enuresis, insomnia, capricious appetite, anorexia, tics and habits, phobias. There is also a sensible chapter on sex instruction, and a short, and, as the reviewer thinks, rather inadequate reference to the views of Freud.

As a contribution to the psycho-therapeutics of infancy and childhood the book will be found most valuable; it is intended for medical men, but it seems to us one from which an intelligent mother might get very many useful hints. Dr. Cameron is most heartily to be congratulated on this little book.

BOOKS RECEIVED.

Basu, D. B.	Diabetes and its Dietetic Treatment. Tenth Edition (*The Panini Office, Allahabad*)	Rs. 1.8
Bayliss, W. M.	An Introduction to General Physiology . (*Longmans, Green & Co.*)	7s. 6d.
Bayliss, W. M.	The Nature of Enzyme Action. Fourth Edition (*Longmans, Green & Co.*)	7s. 6d.
Blythe, Estelle.	Way of Healing . . . . . (*W. Heffer & Sons, Ltd.*)	2s. 6d.
Crowther, J. A.	A Manual of Physics . . (*Henry Frowde and Hodder & Stoughton*)	10s.
Dench, E. Bradford.	Diseases of the Ear. Fifth Edition . (*D. Appleton & Co.*)	30s.
Digby, Kenelm H.	Immunity in Health (*Henry Frowde and Hodder & Stoughton*)	8s. 6d.
Edinburgh University Calendar, 1919–20 . . . . . (*James Thin*)		—
Halliburton, W. D.	The Essentials of Chemical Physiology (*Longmans, Green & Co.*)	7s. 6d.
Hutchinson, J.	Facial Neuralgia and its Treatment. Second Edition (*John Bale, Sons & Danielsson, Ltd.*)	15s.
Kraepelin, Prof.	Translated by Mary Barclay. Dementia Præcox and Paraphrenia (*E. & S. Livingston*)	15s.
Mills, G. Percival, and Humphrey Humphreys.	A Text-Book of Surgery for Dental Students . . . . . (*Edward Arnold*)	14s.
Morris, E. J. McCarthy.	Motionism or The World's True Religion (*The Caxton Press, Ltd.*)	5s.
Report of a Committee of Enquiry Regarding the Prevalence of Pellagra among Turkish Prisoners of War		—
Stoddart, W. H. B.	Mind and its Disorders. Third Edition (*H. K. Lewis & Co., Ltd.*)	—
Turner, Philip.	Inguinal Hernia . . . . . (*J. & A. Churchill*)	9s. 6d.
Wallace, C. Edward.	An Atlas of Dental Extractions. Second Edition (*J. & A. Churchill*)	5s.

EDINBURGH MEDICAL JOURNAL.

EDITORIAL NOTES.

Announcement.

THE proprietors beg to announce that Messrs. W. Green & Son, Ltd., owing to pressure of business in connection with their own publications, have been obliged to terminate their contract as publishers of this *Journal* at the end of 1919.

The Journal will in future be published at the office of MESSRS. OLIVER & BOYD, TWEEDDALE COURT, EDINBURGH, to whom all matters relating to advertising, subscriptions, accounts, etc., should be addressed.

We cannot allow this opportunity to pass without expressing our appreciation of the valuable support we have always received from Messrs. W. Green & Son, Ltd., and the members of their staff during the years they have been associated with us in the production of the *Journal*, and our regret that circumstances have rendered it impossible for them to continue to act as our publishers.

General Medical Council.

DR. NORMAN WALKER, Edinburgh, has been re-elected Direct Representative for Scotland on the General Council of Medical Education and Registration of the United Kingdom.

THE RELATION OF CHEMISTRY TO MEDICINE.

Inaugural Address to the Class of Medical Chemistry.

By Professor G. BARGER, University of Edinburgh.

There are many recent advances in medical chemistry which I might have chosen as subject-matter for this occasion, but in an inaugural address to a general audience I have thought it best to avoid technicalities as far as possible, and to choose a subject of wider scope—the relation of chemistry to medicine, in the past and in the present—and I have been encouraged in this choice by two considerations. In the first place, the history of my subject during the last two centuries can be well illustrated by the history of chemistry in the University of Edinburgh. Thus I shall be able to pay a tribute to the memory of those who before me have taught chemistry to medical students in this University. In the second place, as the first occupant of the new Chair of Medical Chemistry I may perhaps be allowed to give some justification for the foundation of this new chair, some account of my own *raison d'être.*

To the Greeks χημεία, the black art of the magicians, which probably came from Egypt, was also known as χρυσοποιΐα, the art of making gold—for even in antiquity attempts were made to transform the base metals into the noble. After the destruction of the library of Alexandria the Arabians became the chief guardians of chemical knowledge during the earliest and darkest Middle Ages, and of their guardianship we are reminded to this day by such terms as alkali, alcohol, alchemy.

It was in this period that the association between chemistry and medicine began, for most of the Arabian alchemists were physicians. Later, chemical knowledge spread through Spain to Western Europe. Albertus Magnus, a German bishop, and his contemporary, Roger Bacon, a Dominican friar, combined the study of theology with that of alchemy. Basil Valentine, one of the last and best-known alchemists, was a physician, and furnished the first systematic account of the metal antimony and its salt. A change came about in the first half of the sixteenth century through that extraordinary man Paracelsus, for some years Professor of Medicine at Basle. He insisted that the object of chemistry was not to make gold, but to make medicines, and gradually alchemy yielded to iatro-chemistry, the chemistry of

healing. Paracelsus also exercised a great influence by his chemical theory of disease; he believed that in a state of health the fluids and tissues of the body have a fixed chemical composition, which becomes disturbed in disease, and can be brought back to a normal state by the administration of other chemical substances. In this notion we have the first germ of chemical physiology and pathology. A modern illustration would be the correction of the hyperacidity of the gastric juice in dyspepsia by the administration of magnesia or sodium bicarbonate.

Paracelsus introduced into therapeutics the use of copper sulphate, mercuric chloride, lead acetate, and other salts of the heavy metals, which had up to that time been held in great fear on account of their poisonous properties. In this way Paracelsus supplied a powerful incentive to the study of chemistry by apothecaries and physicians, because the preparation of the salts of the heavy metals in a pure state required a much greater chemical knowledge than that of mere vegetable extracts. The influence of Paracelsus continued to be felt during the next two centuries, and the iatro-chemical period was the time of the closest association between chemistry and medicine. Nearly all the chemists of this period were physicians, at least by training. Jean Baptiste van Helmont spent most of his life in practice near Brussels, yet was a pioneer of plant physiology, to whom we owe the introduction of the term *gas*. Franciscus Sylvius, a Hanoverian physician, became professor at Leiden, and had the first university chemical laboratory. Georg Ernest Stahl, the founder of the unfortunate phlogiston theory of combustion, was Professor of Medicine at Halle, and later physician to the King of Prussia at Berlin. Herman Boerhave combined at Leiden the teaching of chemistry and medicine; to him I will return later.

During the iatro-chemical period there were, however, a few important chemists who were independent of medicine. The most famous, perhaps, was Robert Boyle, and I cannot do better to characterise the position of chemistry in the seventeenth century than by quoting to you some sentences from Boyle's *Preliminary Discourse*: ". . . I saw that several chymists had, by a laudable diligence, obtain'd various productions, and hit upon many more phenomena, considerable in their kind, than could well be expected from their narrow principles; but finding the generality of those addicted to chymistry, to have had scarce any view, but to the preparation of medicines, or to the improving of metals, I was tempted to consider the art, not as a physician or an

alchymist, but a philosopher." And this Boyle did with conspicuous success.

But let me return to Boerhave, for him I regard as having been in some measure the father of the Edinburgh School of Medicine of the eighteenth century. It was in 1703 that William Carstares was appointed principal of this University. He was one of your predecessors, Mr. Principal, who contributed most to the advancement of medical and scientific studies at Edinburgh. He had been the friend and confidant of William the Third, and both before and after the Revolution he appears to have visited Holland. He knew the Dutch universities well and determined to imitate Leiden and Utrecht in their teaching of medicine. To one who knows the Dutch universities of to-day, it is evident that they more closely resemble Edinburgh than any other university in Britain. Leiden and Edinburgh are both post-Reformation universities; in Holland and Scotland the Reformation drew its inspiration from the same source—Calvin of Geneva. The University of Leiden was founded in 1575, a few months after the raising of the siege by the Spaniards; it is said that William of Orange, wishing to reward the citizens for their heroic defence, offered them the choice between remission of taxation during a number of years and the foundation of a university. They chose the latter. The University of Edinburgh was founded only seven years later, in 1582. Both in Holland and here we find the same homogeneous body—the Senatus—consisting of professors and professors only.

As a result of the influence of Carstares, the Town Council proceeded in 1713 to "elect, nominate, and choose" Dr. James Crawfurd to be Professor of Physic and Chemistry, the first chemical appointment in this University. Chemistry was not an important subject as yet, for Dr. Crawfurd received no salary, and stranger than that, in 1719 he was appointed in addition Professor of Hebrew. This combination of the Chair of Chemistry and Hebrew must have been unique in the annals of this or any other university.

In 1720, after Carstares death, but doubtless still owing to his influence, Alexander Monro (*primus*) was appointed Professor of Anatomy and with him the fame of the Edinburgh medical school began. He had been the favourite and admiring pupil of Boerhave at Leiden, and Andrew Plummer, who succeeded Crawfurd in 1726, was also a pupil of Boerhave, who thus may be said to have exercised considerable influence on the Edinburgh medical

faculty. William Cullen, who held the chair from 1755–1766, was the first to teach chemistry as a separate subject. His successor, Joseph Black, an ornament of his university, one of the greatest chemists of his time and one of the founders of modern chemistry, was a physician by training. More than that, his most celebrated discovery, the relationship of the fixed to the mild alkalies and the nature of "fixed air" was first written as an appendix to his M.D. dissertation, "*De humore acido a cibis orto et magnesia alba.*" Charles Hope, the discoverer of the maximum density of water, occupied the chair for nearly half a century (1795–1844). During this period the number of students grew enormously, so that the largest class-room in the Adam-Playfair buildings, now occupied by natural history, was built for Hope. For the same reason he had little time for practical work and research, and in 1833 the Town Council proposed the foundation of a second Chair of Practical Chemistry. The proposal was not carried out, however, owing to the opposition of the Senatus. It is remarkable in the history of the University that on various occasions the non-academic Town Council was on the side of educational progress and reform and the Senatus Academicus on the opposite side; we must rejoice that owing to the reformed constitution of the University the motive of self-interest has disappeared which formerly induced the Senatus to resist the institution of new chairs.

In 1844 Hope's successor, William Gregory, was appointed Professor of Chemistry only; Physic was no longer included, but he was still a member of the medical faculty. Until the establishment of the Faculty of Science, in 1893, successive Professors of Chemistry, Lyon Playfair and Crum Brown, were Professors in the Medical Faculty only, and the medical degree of Professor Crum Brown I regard as the last sign of that close association between chemistry and medicine, which in Edinburgh lasted longer than elsewhere. But on his retirement in 1908 a great change was indeed made. Professor James Walker was appointed—a layman, not even an orthodox chemist, for he was the chief apostle in this country of the new physical chemistry of Van't Hoff, Arrhenius, and Ostwald. Perhaps he will allow me a personal reminiscence. Some twenty years ago, when I was an undergraduate at Cambridge, physical chemistry was not taught in any systematic manner, and it was from Professor Walker's text-book that I first began to understand the subject. I hope that he will not repudiate my claim to have been his pupil, in this indirect and impersonal fashion. Professor Walker recognised that medical students were in need of separate

teaching and soon instituted a separate course, distinct from that of the science students; he urged the foundation of a new Chair of Medical Chemistry, and the division of teaching, not according to subjects but according to faculties. It is fitting that this new experiment in medical education should be made in the largest medical school of the country.

I have now shown you how, in the words of Playfair, "chemistry in her period of youth, full of bloom and promise, was forced into a premature and ill-assorted union with medicine." These words were spoken on an occasion very similar to the present one; they occur in his inaugural address of 1858. I have also shown you how chemistry grew to be an independent science, and we may now inquire what benefits medicine has derived from this independence.

I will begin with that branch of my subject with which I am most familiar. The development of organic chemistry in the nineteenth century laid the foundation of chemical physiology; it supplied through its investigation of the fats, the carbohydrates and the proteins, the basis for the study of metabolism, the groundwork for rational dietetics. It is impossible to conceive an understanding of such a disease as diabetes without a knowledge of the chemical constitution of the carbohydrates. I select one further chapter of physiology where organic chemistry has made itself felt—the study of the hormones, those powerful drugs which the organism elaborates for its own purposes. It is now just over twenty-five years ago that Oliver and Schafer made known the great pressor action of extracts of the suprarenal gland. Ten years later, by 1904, the active principle adrenaline had been isolated, and its constitution had been determined. Five years more, and this precious substance was produced artificially on an industrial scale in German chemical works. Sir Edward Schafer and his pupils have also shown us various actions of another insignificant organ, the pituitary body, and one of its actions, that on the uterus, promises to be of greater importance to obstetricians than that of ergot itself. The active principle of the thyroid gland, which has baffled chemists for more than a quarter of a century, has at last been obtained in a crystalline pure condition by Kendall, in the clinic of the Mayo brothers in America. Like other hormones it turns out to be a substance of great interest and potency, reproducing in minute doses the therapeutic effects of the entire gland in cretinism and myxœdema.

Hormones, which are important as drugs, bring me to pharmacology and therapeutics. These subjects have also greatly benefited from organic chemistry. Early in the nineteenth century the alkaloid morphine was isolated from opium, and in passing I may remind you that Edinburgh is now one of the important centres for the manufacture of opium alkaloids. Later, quinine was isolated from cinchona bark, cocaine from coca leaves, and many other vegetable active principles have been discovered through the labours of organic chemists. This has made possible the therapeutic administration of pure substances unaffected by the presence of other active principles which often accompany them in crude vegetable extracts. It has made possible accurate dosage, and has facilitated hypodermic injection. But organic chemistry has also added many substances to the pharmacopœia which do not occur in nature, mere figments of chemical imagination. Here in Edinburgh it is fitting that I should begin with chloroform, introduced by Simpson in 1847, sixteen years after its discovery by Liebig. It was followed by chloral, due to Liebreich, by salicylic acid and its derivatives salol and aspirin, by phenacetine and antipyrine, by hypnotics like sulphonal and veronal, by local anæsthetics like eucaine and novocaine, and by many other substances, some of doubtful value. A new iatro-chemistry has arisen and has flourished chiefly in German laboratories and chemical works. Its highest devolopment is that new branch of pharmacology, termed by Ehrlich chemotherapy, to which we owe salvarsan, a specific of such importance, that on the outbreak of the war it became a question of military importance for the Allies to provide themselves with a supply of the substance. It was part of the cargo of the commercial submarine *Deutschland*, since it was one of the most precious substances which Germany could export.

Other divisions of chemistry have been laid under contribution. Pathology and clinical medicine have been assisted by numerous analytical methods, particularly by the micro-methods worked out by Bang in Sweden, and by Folin and Van Slyke in America, methods which enable us, for instance, to determine the minute quantity of sugar or of fat in a drop of blood, taken from a patient by a finger prick. The physico-chemical results of Van't Hoff and Arrhenius, Ostwald, and Nernst have perhaps been utilised more in biological and medical laboratories than in the chemical laboratories themselves. Biology and medicine have always been ready to apply any new chemical discovery. The new science of

colloidal chemistry is of great importance to biology, and books have been written on its applications to medicine alone. Even radio-activity has become of medical importance, for it gives us what is so far the only hope of non-surgical treatment of malignant disease, and recently the physiological importance of potassium has been shown by Zwaardemaker to depend on the very minute and hitherto neglected radio-activity of this element.

I could go on multiplying examples, but it would be wearisome. I prefer to end with the greatest debt which in my estimation medicine owes, if not to chemistry, at least to a chemist, Louis Pasteur. Passing from a study of crystals to that of fermentation, he founded the new science of bacteriology, of such importance to medicine that it has led to the foundation of separate university chairs, and also of enormous importance to surgery, for without Pasteur's researches, Lister's work at Edinburgh would scarcely have been possible. The debt which medicine and surgery owe to Louis Pasteur, a layman, can hardly be exaggerated.

Mr. Principal, before concluding I wish to address a few words to my fellow members of the Senatus, and more especially to my colleagues of the Faculties of Medicine and of Science. I wish to assure them that, to the utmost of my ability, I will endeavour to maintain the high traditions of this University as a place of learning and research. To my mind the functions of a university are twofold: the imparting of knowledge and the extension of knowledge. I speak with hesitation, but I have carefully weighed my words; it seems to me that in this University the development of teaching has sometimes taken place at the expense of research. Sometimes professors have been too much occupied with lectures and with administrative duties to do justice to themselves as original investigators. But let us consider the case of the younger men, those who have newly graduated, and those about to graduate. The proportion of these who take part in research is small. We cannot expect all students to do research; very naturally they are mainly concerned with their vocational training, and are preparing to practise their professions. But we may expect that a larger proportion of the best students should regard a period spent on original investigation as a normal ending to their academic career, and I can assure them that time spent on research is well spent, and will in due course have its full professional reward. It is from this class of student that the University should be able to choose its assistants, and when so chosen, these assistants should not have all their time taken up by teaching but should have adequate

opportunities for research. In this way it should be possible to diffuse more of an atmosphere of research into the laboratories, and provide an educational instrument, of value even to junior students.

In this respect I hope much from the institution of the new Ph.D. degree to be given for research only. I hope that with our strong colonial connection we may attract our fair share of this new class of students to Edinburgh, but unless we give them suitable facilities, they will not come. In some departments the laboratory accommodation is at present quite inadequate; there is here a great opportunity for generous donors.

I should like also to say a few words to my fellow-chemist, Professor Walker. I wish to thank him for the hospitable way in which he has received me into his department, and for much advice, readily given. I hope that he will soon have the laboratory of which he is in such urgent need, and that when it is built he will work in it happily for many a session to come.

Finally, let me say something to my own students. I do not propose to overburden you with facts; I believe you are already overburdened with lectures. Rather, in the words of a recent inaugural address in this faculty, it will be my object to "grave deeply" those general principles of chemistry which I hold to be of most value for the mental equipment of a medical graduate. I hope to show you in my lectures, as I have tried to do in this address, that chemistry is not a hurdle in the steeplechase of examinations, to be cleared in the first lap and then to be forgotten.

OBSERVATIONS ON THE TECHNIQUE OF BLOOD TRANSFUSION.

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THE writer's interest in transfusion of blood was first aroused in 1913 by the frequent reports on the subject published in the American journals at that time. It was apparent from the favourable results which were being obtained by different observers that considerable progress had been made in the practice of transfusion, and that it was desirable to be prepared to perform the operation in a satisfactory manner. As at this time the operation of direct transfusion was being practised on the lines suggested by Crile, I thought it advisable in the first place to make myself familiar with the technique of blood-vessel surgery by experiments on animals.

EXPERIMENTAL OBSERVATIONS ON TECHNIQUE.

It is obvious that, for operations on the blood-vessels, or for the arterio-venous anastomosis which is necessary for direct transfusion, special instruments, materials, and methods of operating are required, if the risk of premature clotting is to be avoided. My object in the first instance therefore was to establish experimentally a reliable technique for the anastomosis and suture of blood-vessels. Most of the experiments were made either on the aorta of the cat or the dog's carotid, and both vessels proved suitable for the purpose, although the small size of the former renders the manipulation specially difficult, and demands the greatest accuracy in operating. The experiments were chiefly directed towards the study of the different methods of vascular suture, and included the repair of longitudinal and irregular wounds of arteries, end-to-end suture of completely divided arteries, arterio-venous anastomosis, and the narrowing and partial occlusion of arteries by suture and by aluminium bands. As certain of these experiments have no bearing upon the subject of transfusion, reference will be made only to the facts which were observed regarding the general principles of technique as illustrated particularly by direct end-to-end anastomosis of blood-vessels by suture.

The methods described by Carrel and Guthrie were employed

in the first instance, and various modifications were tried in order to find out whether the methods could be improved or simplified to any extent. In anticipation of the conclusions which were come to, it may be stated that no essential modification of the standard Carrel technique was found to be justified. The results of the transverse division and end-to-end suture of the common carotid artery of the dog were particularly successful, and subsequent occlusion of the artery occurred only in one case, in which there was sepsis in the wound, out of a series of ten experiments in which the methods finally adopted were employed. Similar experiments were performed on the aorta of the cat, which was divided and sutured both above and below the inferior mesenteric artery. In spite of the difficulties due to the small size of the vessel, the artery remained perfectly patent in nine out of twelve animals. Failure of such an operation is readily recognised, as ligation or rapid occlusion of the cat's aorta is followed by paralysis of the hind limbs. This occurred only in one of the three cases in which the artery did not remain patent, and in this case apparently a thrombus had formed within a few minutes of the completion of the operation. In the remaining two cases the animals were kept under observation for long periods, and it was therefore obvious that the occlusion which resulted from the division and suture of the aorta must have been gradual, and sufficiently delayed to permit the collateral circulation to become established.

The only special instruments which were found necessary, in addition to the needles and materials for suture, were a pair of fine scissors, two light clamps, and a pair of fine but blunt-pointed dissecting forceps.

Clamps.—Different forms of clamps were tried, including bulldog forceps, Crile's arterial clamp, and the use of tapes. The most satisfactory instrument proved to be a light Doyen's clamp which was subsequently used in all the operations for direct transfusion in my clinical cases. With this clamp the right amount of pressure can be easily applied, and the long handles are convenient for holding the vessels in position.

Needles and Suture Materials.—The finest cambric needles, No. 16, were found to be essential, and selected strands of silk thread proved to be the most reliable material for suturing. It is important to have the silk lubricated with vaseline. This point was investigated, and the risks of thrombosis were found to be greater when the silk was not oiled. The simplest method of pre-

paring the stitch is to draw it through gloved fingers, previously smeared with vaseline, after the needle has been threaded and sterilised. Sterilisation of the sutures in liquid paraffin at a high temperature was found to diminish the strength of the threads.

After experimenting with various needles, clamps, and methods of suturing, the following technique for the end-to-end anastomosis of vessels was adopted.

Preparation of the Vessels for Suturing.—The operations were performed with aseptic precautions, as it was desired to keep the animals alive. The aorta or the common carotid was exposed for a sufficient distance to permit of the vessel being doubly clamped. A thin sheet of dark dental rubber was then drawn beneath the vessel, in order to protect the sutures and to offer a contrast to the white silk threads, which were so fine that considerable eye strain was entailed without the use of a background. The artery was then cut across with a pair of scissors midway between the clamps. As the adventitial coat hangs like a fringe over the open ends of the vessel, it must be pulled down and cut off short, otherwise the stitching will be interfered with and thrombosis will result. A trace of blood is always present within the lumen, even when the vessel has been stripped with the fingers before the clamps are applied, and it is advisable to remove the blood without delay, in case any fibrin is formed. The ends of the vessels should be washed out first with saline, and then with liquid paraffin. During all the steps of the operation, great care is necessary to avoid rough handling, or injury of the intima by excessive pressure with the clamps. It was found that if the intima were damaged by rubbing or bruising, or allowed to dry, that thrombosis was almost certain to follow, in spite of the most exact suturing.

Method of Suturing.—Carrel and Guthrie recommend the introduction of three guiding sutures, to ensure correct apposition of the ends of the vessels. I found Carrel's method satisfactory, but the number of stay sutures is apt to complicate the operation in the case of small vessels such as the aorta of the cat, and also of medium-sized arteries such as the dog's carotid. Unless the guiding sutures are kept taut they readily become entangled. Equally good results can be obtained more simply by the use of two guiding sutures, and the method I adopted was as follows. Two separate sutures were inserted through the entire thickness of the coats of the artery, one in front and one behind, care being taken that the needle passed through corresponding points close

PLATE I.

A.

B.

FIG. 1.—Transverse Division and Circular Suture of both Carotid Arteries (Dog's) four and a half weeks after operation.

A. Shows thickening of adventitial coat of arteries due to stripping from the sheath.
B. Cast showing absence of stenosis. A minute localised projection is present at the sutured level on one side.

PLATE II.

C.

FIG. I.—Transverse Division and Circular Suture of both Carotid Arteries (Dog's) four and a half weeks after operation.

C. Vessels opened to show the repair after end-to-end suture.

to the edge of the open ends of the artery, so that the knot would be outside. The posterior suture was then tied, one end being clamped with forceps, and the other left long and attached to the needle, to be used for the continuous suturing of the ends of the vessel. The anterior stay suture was not tied till later, and was used as a guide and tractor. The ends of the vessel were then rotated so that the posterior suture was to the right, and the anterior suture to the left and the anterior edges of the artery were then sutured from right to left. By gentle traction on the guiding sutures, the edges of the artery were kept exactly opposed to each other. After one half of the circumference had been stitched the anterior guiding suture was tied, and the vessel rotated in the opposite direction so that with the same continuous stitch the remaining half of the circumference was also sutured. I found that there was less chance of leakage if a single continuous suture were employed, and that it was better to tie the second guiding suture separately. The individual stitches should be placed as close together, and as near to the cut edge as is practicable, with the certainty of including the whole thickness of the arterial wall. The needle was passed always at right angles to the coat of the artery, so that the minimum of thread was left exposed within the lumen. With the above technique my results showed that in a large proportion of cases the lumen of the vessel remained permanently patent. The intima soon completely covers the sutured line, and there is no subsequent stenosis where the artery has been stitched.

Arterio-Venous Anastomosis.—In one case an anastomosis was made between the common carotid and the external jugular vein. Both vessels were divided, and the proximal end of the common carotid was united to the peripheral end of the vein. The same technique was found satisfactory, the only modification necessary being due to the greater size of the lumen of the vein. By placing the sutures close together in the artery, and slightly wider apart through the wall of the vein, the junction was satisfactorily completed, but the certainty of a permanently successful result was naturally less than when vessels of similar calibre were united. The junction in this case remained patent for three weeks, during which time a thrill was easily felt in the neck. When the animal was killed one month after the operation, the junction was found occluded by a small white thrombus.

My experiments on blood-vessels showed that arteries could be incised or completely divided and restored by suture with little

risk of clotting. At the same time it was clear that the operation was sufficiently difficult to make it impracticable as a routine method for the direct transfusion of blood in clinical cases. Apart from the technical difficulty of end-to-end suture between vessels of different size, the close proximity of the patients' arms, which is necessary for direct transfusion, is bound to complicate the operation, and in restless patients it would be impossible to perform it satisfactorily.

Although the same objections do not apply to Crile's method of transfusion by means of a cannula which unites the intima of the two vessels, still with this method close apposition of the patients' arms is necessary, and, while the anastomosis is perfect and the risk of clotting is reduced to a minimum, it is certain to be difficult sometimes to make sure that the vessels are not kinked or stretched.

The next object of my experiments therefore was to find out whether direct transfusion could not equally well be done by some means which left more space between the patients' arms than is afforded by suture or by Crile's cannula. It was hoped also to form an opinion from the experiments of the value of transfusion in cases of hæmorrhage, and to compare the value of saline with transfusion in the treatment of such cases.

Observations on the Technique of Arterio-venous Transfusion.

As it seemed desirable, for the reasons stated above, to leave a certain space between the arms of the donor and recipient during transfusion, it was decided to employ some form of tube as a connection between the vessels. For simple transfusion experiments large vessels, like the femoral or carotid, and the corresponding veins, are generally used. Many experiments in the past have shown that it is possible to transfuse a large amount of blood without clotting through a tube which has not been prepared in any special way, or has simply been washed out with carbonate of soda or sodium citrate solution. Only a few minutes are necessary completely to reanimate an exsanguinated dog by transfusion, and the absence of clotting is due to the short duration of the transfusion, and to the fact that it is possible to use a large tube in proportion to the size of the artery. The conditions are quite different when the blood is transfused from the human radial artery as, in cases where the radial artery is

small, transfusion may need to be continued for half an hour or more. It was decided, therefore, to use cannulæ 40 to 60 mm. in length and with an external diameter of 2 to 3 mm., similar in size to those suitable for the human radial artery, and these were employed after a preliminary coating with paraffin.

The preparation of paraffin which proved most suitable for delaying clotting was composed of

Hard paraffin	2 parts.
Soft paraffin	2 parts.
Stearin	1 part.

Blood collected in a porcelain dish coated with this mixture remained fluid for thirteen minutes; in a control dish the blood clotted in five minutes.

Both a coating of hard paraffin and lubrication of the lumen of the cannula with liquid paraffin or vaseline proved successful in delaying clotting during transfusion, and these methods of preparation gave distinctly better results than preliminary washing of the cannula in sodium citrate solution.

The vessels used for transfusion were prepared in the same way as had been employed for the suture of divided arteries. Before tying in the cannula the vessels were therefore clamped, opened, washed out with saline and lubricated with liquid paraffin. Transfusion of the desired amount of blood was readily accomplished with this method, but, as the duration of the transfusion rarely exceeded a few minutes, no evidence was afforded regarding the practicability of using paraffined cannulæ for human patients. The following experiment, however, demonstrated that the cannulæ could be relied on to remain patent long enough to permit transfusion in clinical cases.

Experiment.—1st December 1913. Under an anæsthetic both femoral arteries of a dog were exposed freely and clamped in two places sufficiently apart to permit of glass cannulæ being introduced within the vessels and tied in continuity with the divided ends of the respective arteries. The cannulæ were 40 mm. in length and had an equal internal and external (3 mm.) diameter. The lumen of one had been coated with hard paraffin while the other cannula was lubricated with liquid paraffin.

When the clamps were removed the circulation was re-established through the cannulæ.

The patency of the cannulæ was tested by observing the character of the pulse in the femoral arteries distal to the cannulæ. Clotting commenced first in the lubricated cannula, twenty-nine

minutes after the circulation through the cannulæ had been established. The cannula coated with the mixture of hard paraffin remained clear of clot for thirty-five minutes. At the conclusion of the operation, fifty-five minutes after the clamps had been removed, neither cannula was completely occluded but both contained a clot which was larger in the case of the lubricated cannula.

The results of this experiment suggested that paraffined glass cannulæ could be used with success for transfusion in clinical cases.

Clinical Observations on Transfusion. Description of Instruments and Technique Employed in a Series of Fifty-two Transfusions.

The writer's first clinical applications of transfusion was made on 12th December 1913, in a case of pernicious anæmia, after the necessary experience of the technique had been gained by experience on animals. In the earlier cases direct arterio-venous transfusion was employed, but subsequently various methods and forms of apparatus for indirect transfusion from vein to vein were tried. The methods of transfusing whole or unmodified blood were finally compared with the use of sodium citrate as an anticoagulant. The details of the instruments and technique employed will be described together with the conclusions formed regarding the relative merits of the different methods.

A. *Direct Arterio-venous Transfusion.*

This operation was performed on twenty-one occasions. The radial artery was connected to the recipient's vein by a short cannula.

Paraffined glass cannulæ had proved quite satisfactory for experimental transfusions in dogs, and it was decided therefore to try them in the first instance. An experience of two cases was sufficient to show that they were not entirely satisfactory, and in subsequent cases, when direct transfusion was required, paraffined metal cannulæ were used in preference. The fact that glass cannulæ are transparent is no advantage as the occurrence of clotting can only be observed by the absence of pulsation in the vein beyond, or by noting that the vein is firmer on palpation. Further, in order to fix the glass cannulæ in the vessels, it was necessary to have a slight bulbous expansion of the tube at either

end. The lumen of such a glass tube is necessarily irregular, unlike that of a simple metal cannula, which can be grooved on the outer surface only. When using the radial artery, it is necessary to employ a cannula with the largest possible lumen, and a metal cannula of a given external diameter has a larger and more uniform lumen than a glass cannula of the same size with bulbous ends. In subsequent cases of direct transfusion, metal cannulæ were therefore employed, and these were found quite satisfactory. In certain cases, however, it was found that there was a tendency for the cannulæ to slip or be pulled out of one or other of the vessels. To prevent this, the cannulæ at first were grooved and tied in with silk, but in restless patients it was sometimes impossible to prevent a considerable strain being placed momentarily upon the junction. It was impossible to thicken the wall of the cannula sufficiently to provide deep grooves, owing to the small size of some patient's radial arteries, so that till the method of fixation was modified, there was always some anxiety lest the cannula should be pulled out of the artery or vein.

In order to secure the cannula firmly, in the recipient's and donor's vessels, so that no strain could dislodge it, I introduced special fixation forceps for clamping either end of the cannula where it was included in a vessel. The method of using this forceps is shown in the illustration (Fig. 2). The blades of the forceps were doubly grooved near the tip, so as to include when clamped the whole of the end of the cannula within the vessel. The forceps also provided a useful means of steadying the cannula, and preventing kinking of the vessels during transfusion ; and they also did away with the necessity for grooves or ridges upon the ends of the cannulæ. It was therefore possible to use metal tubes with the thinnest possible wall and the largest internal diameter. A pair of Kocher's forceps will fix the cannula in the vessels if the special forceps are not available.

Although paraffined metal cannulæ proved adequate in a series of five cases, for joining the vessels of the donor and recipient together, considerable difficulty and delay was sometimes experienced in tying the end of the cannula into the recipient's vein, after it had already been fixed in the donor's radial artery. This difficulty depended on the general condition of the patient and the size of the vein. In cases of pernicious anæmia, the superficial veins are much smaller than in cases of primary hæmorrhage or secondary anæmia, and the vein may have to be

stretched before the cannula can be admitted. The small size of the vein, however, does not offer such an obstacle as does restlessness on the part of the patient. Some of the cases of pernicious anæmia which I transfused by the direct method were semi-conscious at the time, and, as they were often unable to appreciate what was being done, were apt to resist or to move the arm before the junction could be completed. I decided therefore to try a double cannula in order to simplify the operation, and found that the double cannula worked well in practice.

Double Metal Cannulæ.—These were used in fourteen cases. Each half of the cannula could be separately tied into its proper vessel, and the junction of the two halves provided a simple method of completing the anastomosis. The total length of the cannula was 55 mm. and two sizes of 2·5 mm. and 3 mm. external diameter respectively were found sufficient to fit any radial artery. The halves of the cannula were prepared from a single tube of uniform diameter, and consisted of a male and female portion, turned to fit one another exactly, so that the lumen had a continuous smooth surface. The double metal cannulæ were prepared at first with a coating of hard paraffin, but this did not prove entirely satisfactory. In spite of the greatest care there was apt to be slight irregularity in the paraffin coat at the line where the two halves joined. Preliminary lubrication of the cannula with vaseline and liquid paraffin was found more satisfactory. The following description of direct transfusion refers to the technique employed when the double metal cannula is used. From my experience I believe that this is the simplest and most efficient method of performing direct transfusion. A similar method has been described by Bernheim.[1]

Direct Arterio-venous Transfusion—Technique of Operation.

The only special instruments needed, in addition to the cannula, were:—

Three or four pairs of fine-pointed artery forceps.

Two pairs of fine-pointed dissecting forceps.

Two light clamps for temporarily controlling the vessels.

A pair of fine-pointed scissors, with narrow blades.

Two glass pipettes with rubber teats, for washing out the vessels with saline and liquid paraffin.

Two special forceps for fixing the ends of the cannula within the vessel.

Selection of Donor's and Recipient's Vessels.—The donor's left radial artery was usually selected. The selection of the vein in the recipient depended upon several factors. Other things being equal, a superficial vein in front of the left elbow was chosen. The median cephalic is perhaps the most suitable, as it permits easy adaptation of the arms, but, if the median basilic appeared to be larger, it was preferred. In cases of primary hæmorrhage it is always easy to find a suitable vein in front of the elbow, but in cases of chronic anæmia, and particularly in cases of pernicious anæmia, the superficial veins of the arm may be extremely small and thin, and I have found it necessary to expose the basilic vein. In cases, however, where the superficial veins in the front of the arm cannot be demonstrated, the external jugular vein is easily found, and is usually of ample diameter to admit the transfusion cannula. In cases where the transfusion was made into the external jugular vein, it was noted that the patient reacted more quickly than when a peripheral vein was used. The external jugular vein is easier to find than the internal saphenous, and in chronic cases of anæmia the latter vein was never employed.

Position of Patients.—In a typical case, when the transfusion was done from the left radial to the left median basilic or cephalic vein, the donor and recipient were placed on parallel tables, lying in opposite directions with the left arms abducted to a right angle, and sufficiently apart to bring the donor's wrist opposite the antecubital region.

For transfusion into the external jugular vein, the donor's table was placed at right angles to the head of the recipient's table, and the arm of the donor was brought into position by abducting it to a right angle.

When the vein in the right arm or the right side of the neck has to be selected, the relative positions of the donor and recipient can be altered accordingly.

There is no doubt that the maintenance of asepsis requires special care during the operation, as there is considerable scope for errors in technique through derangement of towels, in the somewhat awkward and cramped position of the patients.

Anæsthetic.—Novocain (1 per cent.) was used in all the cases for infiltrating the tissues. In one or two of the early cases where adrenalin was used, it was found that the flow of blood from the radial artery was much diminished by spasm. It is therefore, inadvisable to use any vaso-constrictor with the local anæsthetic.

Exposure of Vessels.—It is preferable for the operator and his assistant to expose and prepare the radial artery and the recipient's vein simultaneously; but if this is not possible the recipient's vein should be exposed first.

An incision of 1½ to 2 ins. is ample for exposure of the radial artery, immediately above the wrist, and no difficulty is met with in doing this. Generally two or three minute branches have to be caught, and ligated or twisted, and the accompanying veins may need to be separated.

Preparation of Vessels for Cannulæ.—Both vessels should be exposed before either is opened, and the recipient's vein should be prepared first. Only ½ to ¾ in. of the vein needs to be exposed. The vein is ligated distally, clamped proximally, opened with a V-shaped snip by scissors, washed out with saline and liquid paraffin, and is then ready for the introduction of the cannula. Occasionally it is necessary to divide the vein, but as a rule it is better not to interrupt its continuity. As much of the radial artery should be exposed as the length of the incision will permit. After ligating the artery distally, it should be lightly clamped as close to the proximal end of the wound as possible. The artery may either be divided immediately above the ligature, or opened obliquely with scissors at the same point. I have tried both methods, and believe that it is better not to cut the artery across. All trace of blood is then washed out with saline and paraffin.

As the size of the radial artery varies within considerable limits, it is often necessary to stretch the lumen gently with a pair of fine mosquito forceps before the cannula can be slipped into place. The end of the cannula is then fixed in position by a ligature, and finally secured by applying the fixation forceps. The second half of the cannula is introduced proximally within the vein, and secured in the same fashion. Having completed these preliminaries, the position of the patients' arms is adjusted. Before joining the cannula, it is advisable to fill the lumen of the tubes and of the vessels with normal saline, although there is no reason to expect that any symptoms would result from the small amount of air which might enter the recipient's vein if this were not done. The two parts of the cannula should be kept from separating by holding together the fixation forceps, which, if they are suitably applied, form convenient handles. Both at the commencement, and during the transfusion, the patients' arms must be held firmly together, because even slight traction may narrow the radial artery and diminish the flow of blood. Move-

ments are apt also to cause kinking and interference with the flow.

The clamp controlling the recipient's vein is removed first. When the flow starts, the recipient's vein becomes moderately distended, and if inspected closely the vein can be seen to pulsate. By gently palpating the vein, the pulsation which is transmitted from the artery can be felt, and the amount of blood which is passing can be roughly estimated by noting the strength of the pulsation in the vein.

The duration of the transfusion will depend mainly upon the size of the radial artery. Within a few minutes the patient's

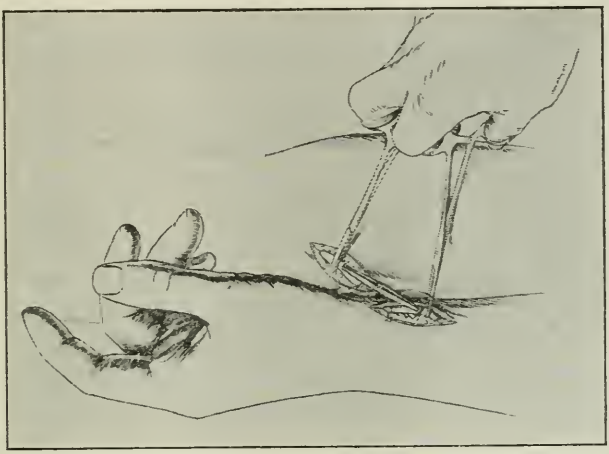


Fig. 2.—Direct Transfusion with Double Metal Cannula. The ends of the cannula are firmly secured by special fixation forceps.

colour may be markedly improved, and within a quarter of an hour the donor may already show signs of loss of blood. In other cases, when the artery is small, and the smaller size of cannula is used, the transfusion may be continued for half an hour or more without causing symptoms in the donor. As a rule, however, after half an hour there is a tendency to clotting in the cannula, generally in the donor's end. If it is thought necessary to continue the transfusion after the occurrence of clotting, the vessels should be clamped and washed out with saline and liquid paraffin after removal of the cannula. A fresh cannula can then be employed. As a rule it is not possible to transfuse much longer after clotting has occurred. In most of my cases of direct transfusion, blood was still flowing when the operation was concluded, and the trans-

fusion was generally stopped either because the recipient was sufficiently improved, or because the donor had lost as much blood as he could safely afford. At the conclusion of the operation, the vessels were ligated, and the wounds closed in the usual manner.

Comments.—The impression obtained from the twenty-one cases of direct transfusion performed with the cannulæ and instruments described above was favourable, and I think it can be claimed that direct transfusion with the double cannula is both reliable and effective. There is no doubt that metal are better than glass cannulæ, and that the double metal cannula simplifies the operation. No case of sepsis occurred in the series of cases, and the risk of air embolism is excluded. The occurrence of clotting towards the conclusion of the operation was almost entirely limited to the instrument; any clot which formed was firmly attached, and none of the cases presented symptoms suggestive of intravascular thrombosis or embolism. With the exception of Crile's method of exact apposition of the intima of the vessels, the double cannula affords a means of transfusion of whole blood with a minimum risk of complications.

As compared with my subsequent cases of transfusion with venous blood, I formed the impression that immediate improvement was more marked when arterial blood was used, but that there was no obvious difference between the two methods in the final result.

Three possible disadvantages are mentioned which are not necessarily present with other methods. The choice of the radial artery incapacitates the donor longer from work than if he is bled from a superficial vein. The method necessarily requires close contact between the patient and donor, and in emotional circumstances, or in particular cases, this may be a disadvantage. More stress has been laid by some observers on the fact that by this method it is impossible to measure the blood transfused. While in some respects this objection to the method is valid, I do not consider that it is as important as the objection to the use of the radial artery. It is apt to be forgotten that in injecting a known amount of blood the volume of the recipient's blood with which it is to be mixed remains unknown. After all, the amount required can only be estimated by judging the effects of the transfusion upon the patient, and this may be done by noting the change in the patient's appearance, and by estimating the hæmoglobin.

B. *Indirect Transfusion from Vein to Vein.*

Although direct transfusion from vein to vein by apposition of the intima of the two vessels can be carried out by an instrument such as that employed by Sorresi, the absence of pulsation in the donor's vein must render it difficult sometimes to be certain that the flow of blood continues; I have therefore not made use of this method for transfusion, preferring the use of a syringe and cannulæ either with or without a two-way stopcock. Since 1916 I have used one or other of the vein-to-vein methods for transfusion of unmodified blood, partly because of the simplicity of the operation and partly because of the slight inconvenience which it causes the donor. Renewed interest in indirect transfusion was stimulated chiefly by the work of Lindemann and Unger.

Indirect Transfusion with Syringes and Simple Cannulæ.

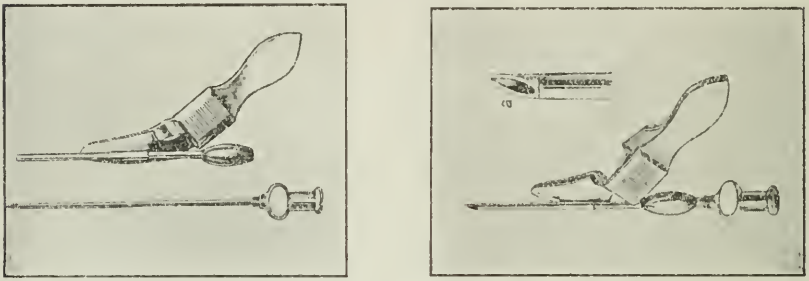
This method was used in eight cases. At least four 20-c.c. Record syringes should be used, and I have found this number ample.

Needles and Cannulæ.—It is advisable generally to tie a cannulæ into the recipient's vein, and it may be necessary to do so also in the case of the donor; but when the donor's vein is large, a needle-cannula can be used perfectly well without incision.

The cannula which I have used for tying into the vein in these cases is a short tube of German silver 30 mm. in length. The outside diameter of the tube is 4 mm. A short piece of rubber tubing, 2 or 3 ins. in length, is attached to the cannula for connection with the syringe. When a needle cannula is used, care must be taken to prevent the cannula shifting its position once it has been introduced. The constant handling necessary in removing and attaching the syringe is liable to dislodge the needle, and I have used several devices for preventing this. As the sharp point of the needle would be liable to wound the wall of the vein, the needle cannula should consist of two tubes, one within the other. The outermost tube is in the form of a cannula, which is 35 mm. in length and has an external diameter of 2·5 or 3 mm. The end of the cannula is blunt, while the point of the inner tube is sharp, and projects slightly beyond the end of the cannula. The sharp point of the needle is bevelled at 35°. After the vein is successfully entered, the combined needle-cannula is pushed on sufficiently far to ensure that the end of the cannula is in the vein; the sharp inner needle is then withdrawn, while the cannula

is left in place and if necessary pushed a little further in. A short piece of rubber tubing serves to connect the cannula to the syringe. The form of cannula which I found most effective is shown in Fig. 3. A bull-dog forceps, which is attached to the cannula, can be clipped on to the skin without pain. By fixing the cannula in this way there is no risk of its becoming dislodged.

Technique of Operation.—The donor's arm is congested by a tourniquet, applied sufficiently firmly to distend the veins without affecting the pulse, and the most prominent superficial vein in the front of the arm is selected. Before puncturing the donor's vein, the recipient's vein should be exposed by a short incision under local anæsthesia. After ligating the recipient's vein distally, it is opened and the cannula inserted attached to a syringe filled with



A. B.

Fig. 3.—Needle-Cannula for Indirect Transfusion.

A. Needle and cannula separated.
B. Needle and cannula fitted together ready for insertion into vein.

saline; the saline should be slowly injected while the needle or cannula is being inserted into the donor's vein.

When the donor's vein has been exposed by incision, it should be ligated proximally and the cannula inserted in a peripheral direction; but when the needle-cannula is used, it is usually more convenient to insert it in a proximal direction.

Both the cannulæ and the syringes should be lubricated with vaseline before being used. The operator requires an assistant to attend to the injection of the blood, while the former should devote himself to the withdrawal of the blood from the donor. The rubber tubes can be nipped with the fingers to prevent loss of blood, or entrance of air, when the syringes are disconnected. By co-ordinating the rate of withdrawal of blood with the rate of its injection, no time is lost in transference. As the absence of clotting depends upon the rapidity with which the syringes are filled and

emptied, a series of syringes should be used in strict rotation, and all trace of blood must be washed out with saline before the syringes are used again. One or two additional assistants are necessary for this method.

With the syringe method, I have injected varying amounts of blood, up to a total of 700 c.c., and have found the results to be as satisfactory as with any other method of transfusion.

Comments.—While the measurement of the blood is not necessary for a successful transfusion, it is certainly an advantage that with the syringe method the amount is known exactly. The measurement of the amount of blood is particularly important in infants and young children. Only a small amount of blood is

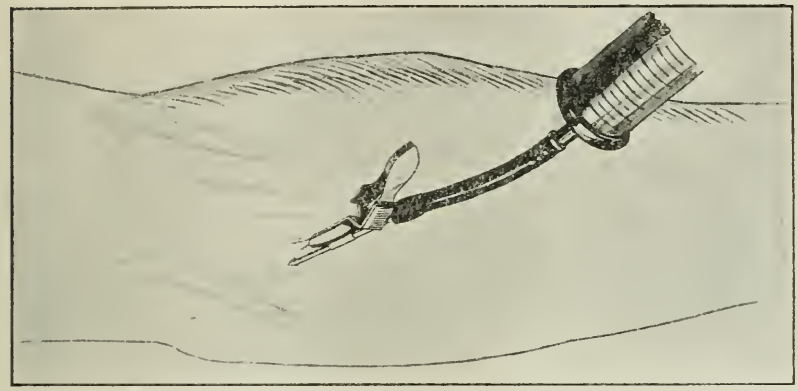


Fig. 4.—Needle-Cannula for Indirect Transfusion. The hollow needle has been withdrawn and the cannula is clipped to the skin.

needed for transfusion in infants, and therefore a knowledge of the amount to be injected will prevent the risks of overtransfusion. I believe that the syringe method is the method of choice for infants. With larger amounts of blood, the question may arise whether clotting may not occur, and it has been suggested that the early stages of coagulation might be initiated by the contact of the blood with the walls of the syringes and cannulæ. So far, however, in the cases in which this method has been used, clotting has not occurred during the transfusion, and none of the cases have shown any signs that the blood had been altered in any way. I found experimentally that 270 c.c. of blood could be drawn from one vein of a dog and reinjected into another vein with a 20-c.c. syringe during a period of four minutes before signs of clotting appeared. The normal coagulation time of the animal's blood was

five minutes twenty seconds. It is obvious, therefore, that in practice, the syringes should be changed at short intervals in order to exclude the risks of clotting and of embolus.

The simplicity of the method is one of its chief advantages, and as no special apparatus is necessary, the means for carrying it out are generally available, or they can be improvised should occasion for transfusion suddenly arise. Instead of the special needles and cannulæ described, short pieces of glass tubing could be used equally well, provided they were tied into the vessels.

The only essentials necessary for the syringe method are several syringes and plenty of assistance, and in this respect the operation is perhaps not as simply arranged for as some of the other methods.

Transfusion of Blood in Infants.

Although there are not many indications for the transfusion of blood in infants, it appears to be the method of choice for cases of hæmorrhagic disease of the new-born, and its employment should also be considered in atrophic infants suffering from anæmia.

As already indicated, the simple syringe method is well suited for the purpose.

Transfusion into the Longitudinal Sinus.

Instruments Used.—Since 1898 Marfan of Paris has used the longitudinal sinus for the intravenous injection of saline. It is also convenient for injection of other solutions such as glucose, sodium bicarbonate, and eusol, when it is desired to give these intravenously. Helmholz, in 1915, recommended transfusion into the longitudinal sinus in cases of hæmorrhagic disease of infants.

The writer has employed this method on six occasions. Apart from the longitudinal sinus, none of the superficial veins in children can be readily penetrated with a needle without a preliminary incision. The advantages of using the sinus are its fixed position, and the fact that the walls are kept apart by the dura mater. As the sinus only lies from 2 mm. to 5 mm. below the surface of the scalp, and as the lumen varies from 4 mm. to 7 mm. in width, penetration with a needle is a simple matter.

The needle which I have used for the superior longitudinal sinus of an infant is 40 mm. in length, and 1·25 mm. in diameter. The point of the needle is bevelled at 45° and is 1·25 mm. long.

It is mounted with an adjustable sliding sleeve, so that the needle, after introduction, may be firmly held against the scalp, and prevented from penetrating too deeply. The needle is connected to a 20-c.c. Record syringe, by a thick-walled rubber tube about 20 cm. in length, and the whole apparatus is lubricated with vaseline oil before use.

Technique of Operation.—In the case of infants, the mother should be chosen as donor, as, according to Sydenstricker,[2] for at least two years the infant's and the mother's blood belong to the same group. The child is wrapped in a shawl, and the head is firmly held with the sagittal suture vertical. A suitable vein in the donor's arm is selected, and a tourniquet is applied. The scalp is disinfected with spirit and biniodide, and the needle should be inserted into the longitudinal sinus before that into the donor's vein. No anæsthetic is required, and it is rather an advantage if the child cries when it feels the prick of the needle, as the pressure in the longitudinal sinus will be increased. After the first prick of the needle the child generally remains quite passive.

The point of the needle should be pushed through the skin in the sagittal plane opposite the posterior angle of the fontanelle, the needle being held at an angle of 50° to 60°. It is usually possible to feel when the point has entered the sinus, and, unless the pressure is negative, blood will flow in drops from the end of the needle. In cases where the pressure is low, no blood may appear, and it is, therefore, advisable to have the needle attached by a short rubber tube to a syringe containing some saline. Should blood not appear in the barrel of the syringe, when it is believed that the needle has penetrated the sinus, slight suction should be applied. When it has been satisfactorily demonstrated that the point of the needle is resting in the sinus, the adjustable sleeve should be slipped down to the level of the scalp, and fixed. In the meantime, blood should be withdrawn from the donor's vein, and, till the first syringeful is ready, a few c.c. of saline should be slowly injected into the sinus to prevent the blood clotting in the needle. In this way 50 c.c. to 100 c.c. or more can be safely given to young infants.

If for any reason citrated blood has to be injected, this can best be done through a needle fitted to the syringe with a two-way stop-cock, such as the writer described for the intravenous injection of eusol.[3]

If reasonable care is taken, there is no risk involved in inject-

ing into the longitudinal sinus fluids used for therapeutic purposes, with the exception of salvarsan. In cases where the longitudinal sinus is small, the needle may go right through it, and may puncture the cerebral cortex, without doing harm. It is only necessary to be sure that the needle is in the sinus before the fluid is injected.

Transfusion from Vein to Vein with Syringe Cannula Apparatus and Two-way Stopcock.

This method of transfusion was used on thirteen occasions. The object is to provide a means of transfusion from vein to vein without the necessity of using so many syringes as are needed for the simple syringe method. The first instrument of this type which I used is shown in Fig. 5. It was first employed in November 1916, and has proved satisfactory. But, although the principle has been retained, several subsequent modifications of the apparatus have been made.

Description of Instrument No. 1.—(Fig. 5).—The cannula consists of a flexible U-shaped silver tube, with an external diameter of 4 mm. The tips of the cannula are about 12 cm. (5 in.) apart, but the distance can be altered by bending the tubes. The limbs of the cannula are united by a two-way stopcock, the lumen of which can be connected alternately with one or the other, by rotating the tap of the stopcock through a right angle. A suitable fitting for the nozzle of a Record syringe is placed at right angles to the U-shaped tube through the centre of the stopcock, and a side tube with stopcock is also provided for injection of saline from a second syringe.

The donor's end of the cannula should not be bevelled, as suction is then less liable to press the wall of the vein against the opening. An additional reason for keeping the donor's end of the cannula blunt is that in suitable cases the end of the cannula can be connected to a special needle inserted through the skin, thus saving an incision.

Technique of Operation.—The cannula and syringes are lubricated with liquid paraffin. The donor and recipient are placed recumbent with the arms in a convenient position. It is more reliable to tie the cannula into both vessels. In this case the donor's end of the cannula should be directed peripherally in the vein. The blood can then be transfused without risk of failure. The use of the needle-cannula, without incision to expose the

donor's vein, may cause difficulty during the transfusion, if for any reason the point of the cannula is dislodged. The clip attachment for the needle-cannula previously described practically eliminates this risk.

Position of Patients.—The donor and the patient should be placed on parallel tables, but lying in opposite directions, with the left arms held at right angles, so that the elbows are opposite each other. The donor's arm is congested with a tourniquet.

The selected veins are exposed for a short distance under local anæsthesia, and ligated, proximally in the case of the donor,

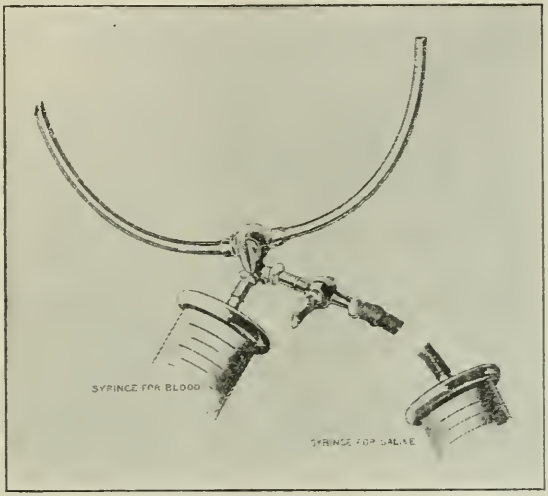


Fig. 5.—Syringe Cannula Apparatus for Indirect Transfusion (1st Pattern).

and distally in the case of the recipient. The veins are then lightly clamped, opened, and washed out with saline and liquid paraffin, and the end of the donor's cannula is inserted and fixed in position. For the better fixation of the cannula, the special clamp forceps described for direct transfusion is used. The stopcock is now turned so as to connect the donor's end of the cannula with the fitting for the transfusion syringe, and the clamp controlling the donor's vein is then removed. When the blood has passed through the stopcock, the transfusion syringe is connected and filled with blood. The tap of the stopcock is now rotated, and the recipient's half of the cannula is filled with blood from the syringe, and then inserted into the vein, where it is fixed with clamp forceps. This takes only a moment, and excludes the

risk of injecting air. After the recipient's end of the cannula has been inserted and fixed within the vein, the light clamp controlling the vein is removed, and a syringeful of blood is injected. By alternately turning the tap of the stopcock, the syringe can be filled from the donor's vein and emptied into the vein of the recipient. I have transfused with this method up to 900 c.c. of blood without any difficulty of clotting, to prevent which various steps have been taken. Unger has succeeded in transfusing large quantities of blood with a single syringe, without detaching the syringe, by spraying the barrel with ether during the transfusion. I found that there is no tendency to clotting if two syringes are kept ready, and used in turn about once a minute. At the same time it is advisable occasionally to inject a little saline in order to keep the stopcock clear.

Description of Instrument No. 2.—Although the original instrument described above proved to act well, the rotation of the tap of the stopcock through a right angle proved awkward, and the instrument was therefore modified.

The stopcock is 8·5 mm. at its widest part, and its lumen is Y-shaped on horizontal section. The apertures of the divergent limbs are only 3 mm. apart, and moreover the blood-stream has not a right angle to negotiate, but an obtuse angle of 150°. It was found in practice that the more limited range through which the tap had to be turned made it easier to work. In other particulars the details and method of using this instrument were similar to the first type.

Description of Instrument No. 3.—In order still further to simplify the manipulations and limit the assistance required, further modifications were introduced in a third form of two-way cannula. When the first two types were being used, the surgeon required both hands for working the syringe, while an assistant turned on the stopcock. It sometimes happened that this was not done at the correct moment. As it would therefore be better for the operator to control the combined action of the syringe and stopcock, the instrument shown in Fig. 6 was devised. The stopcock in instrument 3 is on the same principle as that of instrument 2, but is 13 mm. in diameter. Instead of the metal limbs of the cannulæ of previous types, provision was made for connecting the stopcock to the two cannulæ in the veins by suitable pieces of rubber tubing. A further improvement in this instrument was made by altering the method of attachment of the syringe to the stopcock, by the provision of a lock for the

nozzle of the syringe, the side tube for the transfusion syringe being grooved to receive a small pin fixed on to the nozzle. A Record syringe can easily be adapted in this way. After inserting the nozzle into the socket, the pin is made to lock by slight rotation of the syringe. A metal handle is attached to the stopcock, so that the apparatus can be comfortably held and steadied with the left hand. The handle carries a sliding thumb-piece operating a hinged lever which controls the movements of the tap on the stopcock. The slide has a movement of only 20 mm.

In practice the operator can conduct the transfusion without

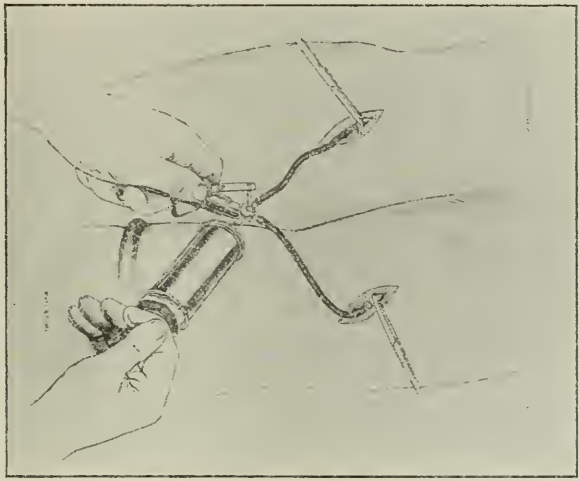


Fig. 6.—Syringe Cannula Apparatus for Indirect Transfusion (3rd Pattern). The stopcock is rotated by a sliding hinged lever attached to the handle held in the left hand.

assistance in manipulating the instrument. The piston of the syringe is worked with the right hand, and the tap of the stopcock is rotated by moving the slide upwards or downwards with the thumb of the left hand. The stopcock is made in two pieces, and these, together with the spring lever, can be easily detached for cleaning. I am indebted to Mr. Norman Dott for valuable suggestions regarding the design of these instruments.

Comment.—The chief objection to all the methods of transfusion by means of a syringe and cannula with two-way stopcock, is the large amount of surface with which the blood comes in contact outside the body. Unger, however, and others, have found that this objection is more theoretical than practical, and

my own experience confirms the good results which others have obtained with similar forms of apparatus. There has been no clotting in the instrument in any of my cases, although it is almost impossible to imagine that the blood can remain unaltered. The blood in the syringe and cannula is kept in almost constant movement, and this is the principal reason why clotting does not occur. I think it can be safely said that the practical value of the method has been established, and it is certainly one of the quickest methods of performing transfusion.

As compared with the citrate of soda method, the syringe and cannula method is quicker, when the time taken to prepare, as well as to inject, the citrated blood is considered. If the citrated blood is already prepared, it can of course be injected more quickly than by any other method.

Transfusion with Anticoagulants.

The use of alkaline salts for delaying coagulation has been known to physiologists for many years. Certain of these substances, such as oxalate of soda, are quite unsuited for transfusion and, till recently, the practicability of applying citrate of soda for transfusion does not seem to have been investigated. The proportion of sodium citrate to blood for laboratory work has usually been 1 per cent., and as in this strength only a moderate amount of blood could be transferred without toxic effects, it was not till Lewisohn in 1914 showed that blood containing 2 per cent. of sodium citrate, sufficient to prevent coagulation, could safely be injected in large amounts that the value of the salt for transfusion was finally demonstrated. Recent writers have overlooked the fact that sodium phosphate was used to a considerable extent twenty or thirty years ago as an anticoagulant for transfusion. Those who worked with phosphate of sodium found, however, that coagulation could not be safely prevented without a larger proportion of the salt than is now known to be necessary in the case of sodium citrate. Leech extract has been proposed as an alternative to alkaline salts, but the experimental and clinical observations of Lewisohn and others have not been encouraging. According to Hooker and Satterlee[4] the preparations of hirudin sold commercially vary as regards their toxic action. Apart from the difficulty of obtaining standardised preparations, there are the further disadvantages that hirudin cannot be sterilised by heat without destroying its activity and that, even if prepared under aseptic conditions, it is difficult to keep sterile in solution.

Transfusion with Citrated Blood.

This method was used in ten cases. A series of observations was made in order to confirm statements made regarding the anticoagulant effects on blood of various strengths of solutions of sodium citrate. 10 c.c. of my own blood were withdrawn into clean sterile test-tubes containing 1 c.c. of varying strengths of sodium citrate solution and the coagulation time was noted in each case. In the control tube the blood clotted in two minutes. Citrate in the strength of 0·05 per cent., 0·1 per cent., and 0·15 per cent. delayed clotting from twelve to fifteen minutes. This experiment was repeated with blood from another individual and a similar result was obtained. Blood containing 0·2 per cent. of sodium citrate remained fluid for several days. These facts confirm the observations that blood is not prevented from clotting by a weaker solution than 0·2 per cent., but they are at variance with the statement that weaker solutions do not at all delay the coagulation time of the blood. It was found that the weaker solutions, while not preventing clotting, delayed it for a few minutes in proportion to their strengths.

In practice it is advisable to provide for a stronger mixture than 0·2 per cent. in order to obviate the risks of error in measuring the amount of blood when it is mixed with the citrate solution. An isotonic solution of sodium citrate (3·8 per cent.), as recommended by Robertson, is admirably adapted for the purpose. If mixed in the proportion of 50 c.c. to 500 c.c. of blood the final solution of citrate will be 0·38 per cent., ample to prevent coagulation and insufficient to cause any risk of toxic symptoms.

Withdrawal and Preparation of the Blood.

Although elaborate methods for collecting and mixing the blood have been recommended, I have found in civil practice that the simpler methods were entirely satisfactory.

The donor's arm is congested with a tourniquet and the largest available vein is selected. A short needle-cannula of large bore, similar to the one described under the syringe method of transfusion, and prepared by lubricating with liquid paraffin, is inserted proximally into the donor's vein. The hollow needle is then withdrawn, leaving the cannula clipped in place. The blood is allowed to flow directly into a wide-mouthed graduated flask, to which has been added previously 50 c.c. of 3·8 per cent. solution of sodium citrate. If a larger amount of blood is required citrate

is added in proportion. The blood should be gently stirred with a glass rod, while it is being collected, to ensure thorough mixing with the citrate solution; 700 c.c. of blood can usually be obtained, and sometimes more, before clotting commences, if a cannula of not less than 2·5 mm. or 3 mm. diameter has been used.

Injection of the Blood.

The simplest method is to allow the blood to flow by gravity through the funnel, tubing, and cannula used for infusion of normal saline. After the collection of the blood and during its transfusion the flask should be kept in a basin of warm water slightly above blood heat.

Comment.—Although the toxic dose of sodium citrate, when injected intravenously, has not been definitely established in man, there is ample clinical evidence that it is much greater than the amount required for purposes of transfusion. Lewisohn[5] concluded from his experiments that the toxic dose of sodium citrate would be between 10 and 15 grammes, and believed that 5 grammes, more than sufficient for transfusion of 1000 c.c. of blood, could be safely given. In this connection it is interesting to note that Robertson[6] and others have regularly injected 6 grammes of sodium citrate, in cases of hæmorrhage and shock, without observing harmful effects from this quantity whether injected with 500 or 800 c.c. of blood. The solution which Robertson recommends is isotonic, consisting of 160 c.c. of a 3·8 per cent. solution of sodium citrate. The theoretical objection to the use of sodium citrate, on the grounds that it might lower the coagulability of the recipient's blood after transfusion, has been disproved by experience. Both Lewisohn and Weil pointed out that any alteration in the coagulation time is rather the reverse of what would be expected, and that shortly after transfusion the coagulation time of the patient's blood may actually be less than it was before. In a case of pernicious anæmia transfused with 450 c.c. of blood, and receiving 1·5 grammes of citrate, the writer observed that the coagulation time of the blood was reduced from five minutes thirty seconds, before transfusion, to three minutes forty seconds, after transfusion. Subsequent examinations showed an absence of any deviation from the normal coagulation time. It can be stated therefore that there is no marked retardation of coagulation after transfusion with citrated blood, the occurrence of which would

limit the general application of the method. In order to render the blood incoagulable *in vivo* it would be necessary to inject more than a toxic dose of the drug. Even after severe hæmorrhage there is sufficient reserve of calcium in the tissues and in the blood to re-establish the conditions necessary for coagulation of the transfused blood.

The experimental work of Rous and Turner, and the clinical work of Robertson on the preservation of corpuscles in citrate, dextrose, and gelatin solutions, have proved that citrate has no injurious effect upon the life of the corpuscles within a reasonable time. In cases of primary hæmorrhage which I treated with citrated blood, there was every indication that the corpuscles continued to live and to function after being transplanted. The suggestion that injections of citrated blood will lower the patient's blood-pressure is disproved by clinical evidence. Patients suffering from low blood-pressure as the result of shock and hæmorrhage can be resuscitated and the blood-pressure can be raised quite as well by injection of citrated blood as by transfusion of unmodified blood.

It is admitted by most observers that reaction in the form of a rigor or rise of temperature are more frequent after the use of citrated blood than when one of the forms of transfusion with unmodified blood has been employed.

Bernheim states that a chill occurred in from twenty to thirty minutes after the blood had been introduced in about 22 per cent. of sodium citrate cases. During this reaction the temperature may rise abruptly as high as 104° or 105°, but the whole disturbance is over in three or four hours. The chill occurs in spite of the most perfect preliminary tests, but he has never noticed the slightest harmful effect. Lewisohn recorded 130 cases in which 15 per cent. exhibited a chill following the operation. Robertson, employing a much larger amount of sodium citrate, also found that the patient not uncommonly suffered from chill either during or immediately after the transfusion, but any discomfort the patient suffered was only temporary. In my own cases there has been no serious reaction following transfusion which could be attributed to the use of sodium citrate.

Transfusion with citrated blood is certainly simpler than any other method, and has the additional advantage that the patient need not come in contact with the donor. It has also made it possible for the blood to be transported, although the necessity for this cannot often arise. In two of my private cases it was

possible to collect and prepare the blood in hospital, where previously tested donors were available, and to transport it to the patient's bedside with a minimum of delay. In both cases there was the satisfaction of feeling that the method had been the means of saving life. Another advantage of the method is that, especially in operation cases, it permits the transfusion to be carried out at the psychological moment. When operating upon an exsanguinated patient I have found it advantageous to be able to transfuse during or at the conclusion of the operation as seemed indicated by the patient's condition and the state of the blood-pressure.

Sufficient cases are on record to show that citrated blood has been used successfully for most conditions in which transfusion is indicated. The extensive use of this method in France has disproved the theoretical objections to the use of an anticoagulant in cases of hæmorrhage and shock. Further experience is, however, necessary in order to prove whether citrated blood is as effective as transfusion of unmodified blood in cases of essential anæmia. My own impression is that, in cases in which the anæmia is a symptom of disease, one of the methods of whole blood transfusion should be preferred to the use of an anticoagulant. I was able to compare the effects of citrated and of whole blood in a case of pernicious anæmia. The patient was transfused twice from the same donor, whose blood was known to be compatible. A similar amount of blood was injected on both occasions (450 c.c.) The subsequent progress of the case and the blood-counts showed that the citrated blood failed to produce any continued benefit and that the corpuscles were destroyed within a few days. When whole blood was transfused a few days later by the syringe and two-way stopcock cannula method, the transplanted corpuscles were not only maintained intact, but the bone-marrow was stimulated and a remission of the symptoms was initiated.

Although it is improper to draw conclusions from one case, the observation recorded above confirms the impression that in conditions such as pernicious anæmia, unmodified blood should be given when transfusion is indicated.

Conclusions regarding Results Observed with Different Methods.

I. *Direct Transfusion.*

(*a*) It reduces the chances of thrombosis and embolism to a minimum.

(*b*) The operation is more difficult to perform than indirect transfusion.
(*c*) The use of the radial artery is a greater sacrifice for the donor than a vein.
(*d*) The radial artery is occasionally too small for the purpose,
(*e*) The amount of blood cannot be exactly measured.

II. *Indirect Transfusion.*

A. *The Use of Syringes and Cannulæ, with or without Two-way Stopcock.*

(*a*) The operation is simpler than direct transfusion.
(*b*) The method demands less sacrifice from the donor.
(*c*) The operation can be more quickly performed than direct transfusion, or any other method.
(*d*) The amount of blood transfused is known.
(*e*) The risks of clotting in the apparatus can be obviated.
(*f*) Simple instruments can be improvised for the syringe method.
(*g*) The patient and donor must be brought into contact.
(*h*) The syringe method is the method of choice for infants.

B. *Citrate Method.*

(*a*) Sodium citrate mixed with blood in the proportion of 0·2 per cent. maintains the blood fluid for several days. In practice it is advisable to use a stronger proportion of citrate (0·38 per cent.).
(*b*) Citrated blood can be safely used several hours after preparation.
(*c*) The withdrawal and preparation of blood for transfusion is simple.
(*d*) An incision is not required to expose the donor's vein.
(*e*) There is more tendency to reaction than after transfusion with unmodified blood.
(*f*) When a reaction occurs, it does not affect the patient seriously.
(*g*) Large quantities of blood can be transfused without fear of toxic action on the part of the citrate.
(*h*) Results in shock and primary hæmorrhage are as satisfactory as with unmodified blood.
(*k*) The coagulation time of the blood is temporarily shortened after transfusion with citrated blood.

(*l*) There is no risk of increasing the tendency to hæmorrhage after the use of citrate of sodium.

(*m*) Unmodified blood should be preferred to the citrate of sodium method in pernicious anæmia and other diseases of the blood.

REFERENCES.—[1] Bernheim, *Blood Transfusion, Hæmorrhage, and the Anæmias.* New York, 1917. [2] Sydenstricker, *Journ. Amer. Med. Assoc.*, 9th June 1917. [3] Graham, *Brit. Med. Journ.*, 6th May 1916. [4] Hooker and Satterlee, *Journ. Amer. Med. Assoc.*, 26th February 1915. [5] Lewisohn, *Surg. Gyn. and Obstet.*, 1915, xxi. 37. [6] Robertson, *Brit. Med. Journ.*, 6th May 1919.

THE POSITION OF THE GENERAL HOSPITAL IN A REGIONAL SURVEY.*

By Sir NAPIER BURNETT, K.B.E., M.D., F.R.C.S.

Introduction.—The verdict of history, in explaining the success of the Allies in the recent war, will surely be that it was due to concentration and co-ordination of effort. This truth is nowhere better illustrated than in the study of the health of our armies in France. Throughout the Napoleonic Wars there was something like 90 per cent. more deaths from disease than from bullets; in the South African War the sickness figure, although still high, fell to 60 odd per cent., and in the recent war, when the final figures are published, it will be found that the deaths from sickness as compared with bullets will be under 20 per cent.

I suggest that the explanation of this remarkable result is to be found in the detailed provision made by the medical officers—both regular and temporary—for the prevention and cure of disease.

Let me direct your attention from what history will assuredly record as a glorious chapter in scientific attainment, to the warfare that exists in our own midst from day to day—the warfare with disease in civil life. How are our forces organised for this campaign? Take first the medical profession; in contrast to the organised system under the military *régime*, the scientific forces at home are loosely arranged and with but little or no attempt at organisation. Individualism remains an outstanding feature of the medical profession, each man working on his own. Try to picture what might be accomplished by a collective and united effort by the medical forces of this country. Great progress has undoubtably been made in many directions; take, for example, many of the zymotic diseases—typhoid, typhus, and smallpox—these are now so rare that many medical men engaged in practice during the past ten to fifteen years have never seen a single case of any of these three maladies. In the counties of Northumberland and Durham there exist to-day, as a monument to that foul disease of smallpox, some 28 hospitals containing 730 beds entirely reserved for the treatment of that disease, but they remain empty from year to year.

Many other instances might be quoted in illustration of the

* An address delivered at the Royal Infirmary, Aberdeen 23rd September 1919.

progress that has been made, both in preventive and curative medicine; but when we look at the periodic returns of the Registrar-General, we find that disease as the enemy of the human race is still firmly entrenched in the form of cardiac, renal, pulmonary and malignant diseases, infantile mortality, puerperal sepsis, and mentally deficient children.

What is the explanation and wherein do we fail to overcome in our battle with such diseases? As I have said, during the war our efforts were co-ordinated and much real progress was attained; but why should war monopolise all our best efforts? The call is as urgent during peace as during the years of war for a united and organised profession, and this I suggest is capable of attainment when each medical man regards his service from the point of view of the needs of the nation.

Hitherto no single department of our Central Government has been responsible for health matters: authority has been divided between the Local Government Board, the Home Office, the Board of Education, etc., but now, with the establishment of a Ministry of Health, the country has taken the first real step towards the ideal of unity of command. The new Ministry has been established with the dual purpose of, first, co-ordinating all existing efforts in the battle with disease, and secondly, to institute legislation necessary to further the great campaign.

Just as there was divided authority over health matters in the Central Government, so at the periphery confusion still more abounds. Take, for example, your own locality: What is the organisation and who is the authority controlling the health of this community? There are the Poor Law or Parish Council, the Town Council with its Health Committee acting through the Medical Officer of Health and his staff, the Royal Infirmary and the other hospitals of the city and districts, each working independently of the others; there is the local Pensions Committee, the Factory Inspector reporting to the Secretary of State or the Board of Health, the Asylum Committees responsible to the Board of Control, and the general medical practitioners. Although dealing with cognate matters, there is practically no co-ordination between these bodies—there is no unity of effort—with the result that much expense is incurred and energy dissipated.

Just as unity has been attained centrally in the Ministry of Health, so there is an urgent need for a replica of the Ministry in the various districts throughout the country—an authority that will unify and direct all local energies pertaining to health.

What form this local authority is to take and over what area it is to exercise jurisdiction, are questions that have not yet been decided by the Ministry of Health, but I wish to-day to bring to your notice some suggestions for the division of the country into regions or provinces for the administration of all matters pertaining to public health.

Local government executives consist to-day in the main of two bodies, viz. (1) the Urban and Rural Councils and (2) the County Councils: these are the present local authorities responsible for carrying out the laws as passed by Parliament. It is well known that at present these bodies are being taxed to their utmost capacity in carrying out the existing legislation, and the prospect of further burdens being placed upon them, it is feared, may result in some of the work being left either undone or carried out in an indifferent manner. The Government, on the other hand, in fulfilment of the promises made at the last General Election, have been carrying through a large volume of fresh legislation, probably without giving much thought to the capacity of the local executive machine to administer the new Acts of Parliament. Therefore I suggest that the time is now opportune for the Legislature to consider the advisability of *strengthening or supplementing* the present local government executives by the establishing of regional areas or provinces, each region to be administered by a Health Council, whose main function would be the supervision and co-ordination of all matters pertaining to health.

In support of such a proposal I submit the following reasons:—

1. The present arrangement of Rural and Urban Councils is too parochial for dealing with the great problems of Public Health; the importance of the subject calls for a wider vision.
2. The Ministry of Pensions, which has only to deal with a relatively small part of the problem that lies ahead of the Ministry of Health, has felt it incumbent to decentralise in order to overtake the work, and the country has been divided into so many regions, each having its advisory council.
3. Some years ago the present Secretary of State for War aroused considerable interest by a speech in which he outlined a scheme whereby the country might be divided into separate provinces, with the object of devolving larger powers of local government, so as to relieve the legislative congestion of the Central Government, and

only two months ago did the present Government agree to set up a commission of inquiry into this very subject of devolution.

4. If the highest spirit of integrity is to be maintained in local government, I suggest that the granting of large powers of local autonomy will attract the best type of men for public service. Let me quote in this connection a sentence from a contribution by Mr. Henry Hobhouse, read at the International Congress on the Administrative Sciences held at Brussels in July 1910: "The greatest advantage of devolving large powers on local bodies is undoubtedly the encouragement of local public spirit. The more important the functions devolved, the more likely you are to get public-spirited men to give time and money to the local administration. It has for many years past been a striking feature of English society that so many men of capacity and integrity have been found to do public work without remuneration. If this healthy spirit is to continue we must give our local bodies plenty of freedom to act within the limits assigned to them by law."

With the division of the country into regional areas, the ground would be cleared for instituting a *National Sanitary Survey.*

It has been suggested that logic translated into reasoned action is probably not the most outstanding feature of the British people: on the contrary, it would seem that we have not been averse as a nation to the policy known as "muddling through." In the past there has been a good deal of "muddling" in health matters, but with the physical shortcomings of the race, as revealed by the Ministry of National Service during the war, and the quickened conscience of the people now developed in regard to health, the way is open for the new Ministry of Health to obtain sound legislation of a far-reaching nature. But before such legislation is undertaken, I suggest that it is essential for a sanitary survey of the nation to be made in order to ascertain the "facts" as they at present exist throughout the country—in short, get the facts first and thereafter legislate! A central bureaucracy in London is not always able fully to appreciate the importance of the local conditions and local needs of a community; these conditions and requirements are best known and appreciated by those resident in and conversant with each locality.

Therefore I suggest that the necessary survey of each district should be undertaken by those resident in the locality, always under the supervision and authority of the Ministry of Health in order to guarantee uniformity in the nature of the data to be collected and the interpretation of the same.

In order to demonstrate that this proposed survey is no mere chimera, but rather a practical suggestion capable of elucidating important data, let me illustrate how an area or district may be surveyed by what has been accomplished in the North of England by the recently formed North-Eastern Hospitals Association. The primary function of this association is to obtain information as to the existing provision in the north-east area of organisations for the prevention and treatment of disease; to ascertain how far these organisations fail to carry out their proper work, and to suggest what developments and additions are desirable in order to provide a complete and co-ordinated hospital system.

The provision of adequate hospital accommodation is a matter of vital importance to every class in the community, and it would appear to be the duty of each district in the country to take immediate steps to co-operate with the Minister of Health in collecting for him reliable data and well-considered suggestions.

The area selected for the survey extends from Berwick-on-Tweed to Middlesbrough on the Tees, and includes the counties of Northumberland and Durham and the Cleveland district of the North Riding of Yorkshire—an area extending over four thousand square miles or approximately two million acres, with a population of two and a half million people and an annual rateable value of over ten million sterling. The province is one that is well defined; it is bounded by the Cheviot Hills on the north-west, by the Pennine range on the west and by the Cleveland Hills on the south, and having the seaboard on the east. Between the Pennines and the Cleveland Hills there is, as it were, an open space—the shed of the river Tees—leading south into the Vale of York, and between the north end of the Cheviots and the seaboard is a piece of flat country some 10 miles in breadth—the gateway into Scotland.

The trade of this province is in large measure limited to the two important industries—shipping and shipbuilding, and mining—coal and iron.

The area is covered by a network of railway communications, all, with one slight exception, belonging to the one company, and

within the area are the three important rivers, the Tyne, the Wear, and the Tees.

Such a province may be described as a trade area—centering round the large towns on the banks of these rivers.

South of Middlesbrough, trade communications tend to centre round Leeds—the capital of another province; and north of Berwick, trade concentrates towards Edinburgh and Glasgow.

The Hospitals Association in its survey of this north-eastern province has collected the following data, viz.:—

(*a*) The surface area of the province, its population and rateable value.

(*b*) The medical men in each locality.

(*c*) The nurses practising midwifery in each locality.

(*d*) The various types of hospitals, dispensaries, and convalescent homes.

(*e*) The birth-rate and infantile mortality-rate in each locality.

(*f*) The population living in one-, two-, and three-roomed houses.

(*g*) The transport facilities—rail and road.

These data have been worked out in the form of maps which reveal in a rather prominent manner certain striking facts in regard to the existing health conditions of the area—facts which are rather lost sight of when recorded in the annual reports of the medical officers of health of the various localities.

So far as the survey has already gone, let me indicate some of the outstanding features.

Hospitals.—The following figures indicate the extent of the hospital accommodation in the area, viz.:—

	Hospitals.	Available Beds.
A. General and Special Hospitals . . .	39	1924
B. Infectious Diseases Hospitals—		
(*a*) General infections	46	1923
(*b*) Smallpox	28	730
(*c*) Post sanitary	4	112
Total . . .	78	2765
C. Poor Law Workhouse Infirmaries . .	28	3857
Grand total . .	145	8546

These figures do not include asylums for lunacy patients or sanatoria for tuberculosis cases.

One thousand nine hundred and twenty-four general and

special hospital beds for a population of two and a half millions represents a *hospital bed-rate of 0·76 per 1000 of population.*

Some twenty years ago the generally accepted hospital rate was 1 to 1·5 per 1000 of population, but to-day hospitals attract a much larger *clientèle* than they did in those former days: formerly medical men experienced some difficulty in persuading their patients to go to the local hospital for treatment. In those days the prevalent idea was that the general hospital or infirmary was an institution for the treatment of the "sick and lame poor," and such is the designation still to be found on the charter of some general hospitals.

During the past twenty years a great change has been going on in the attitude of the people towards hospitals. Hospitals now attract the people instead of repelling them; they no longer require to be persuaded to go to the infirmary, but rather they ask their medical attendants to secure them admission into the hospital.

In short, the public now appreciate the value of hospital treatment, realising that the best possible that science can do for them, both in diagnosis and treatment, is to be found in our general hospitals.

The general hospital to-day attracts not only the public, but possesses the confidence of the general medical practitioner, who realises that he can obtain assistance for his clients not only in the general medical and surgical wards of the hospital, but also in all the special departments which are now such a prominent feature of our present-day hospitals. As a result of this great change, then, that has been taking place in the basis of supply of hospital patients, the ratio of hospital beds to population has to be altered, and I put the present-day figure at something like 3 per thousand of population in urban and industrial areas, and for rural and agricultural districts 2 per thousand.

Let me now examine how these 1924 general hospital beds of the area supply the needs of the community.

In the hospitals that I have visited there are approximately some 3000 names on "the waiting list." But these waiting lists by no means represent all the cases requiring hospital treatment who would apply if they thought there was any prospect of gaining admission. These lists bear a serious relationship to the question of national economy, by way of unemployment and lessened production. I am well aware that the waiting lists require to be

interpreted with some degree of intelligence, and it is not to be implied that all the people whose names are on these hospital lists are unemployed because of their disabilities, but a certain percentage of these people are undoubtedly compulsorily unemployed, and even if many of them continue at their employment, I suggest that in view of the fact that the hospital authorities considered their disabilities to be such as to require hospital treatment, the work these people do must be more or less inefficient, apart altogether from the question of risk and personal suffering. But not only do these waiting lists exercise a direct influence on the national economy, but I suggest that they are also a casual factor in the general social unrest. I have witnessed a miner pleading with the House Governor of an infirmary for the admission of his child for a surgical operation, and the man left the institution discontented, having been told that the patient could not be admitted because of the precedence of more urgent cases for the available beds. This man does not leave his discontent on the doorstep of the hospital but carries it with him into his "Lodge."

One Medical Officer of Health, who is also the School Medical Officer for the district, informs me that while he and his assistants diagnose ailing children in school, and recommend them to the general hospital for treatment, many remain untreated because of the lack of accommodation.

In a well-governed town or city there should be no waiting-list cases; there should be sufficient beds to admit everyone who could justifiably be regarded as in need of hospital treatment. If the voluntary hospitals cannot provide this accommodation, then the Ministry of Health must step in and provide it.

What are the nature of the diseases most commonly found on the waiting lists? They are largely chronic surgical cases such as hernia and hæmorrhoids—conditions that are accountable for a considerable amount of suffering and disability—and medical cases.

The fact which the survey reveals, that there are in the aggregate some 3000 names on the waiting lists of the hospitals in the area, supports the idea of the gross inadequacy of 1924 beds for a population of two and a half million people. In contrast you will observe the hospital provision for infectious diseases—a total of 2765 beds; and of these exactly the same number of beds (1923) for the general infectious diseases as there are (1924) in general and special hospitals treating all manner of non-infectious diseases and

accidents. Look now at the provision of hospital beds in the Poor Law Workhouse Infirmaries, of which there are 28 in the area, with no less than 3857 beds. The majority of these infirmaries, although situate in workhouse grounds, are entirely separate buildings from the workhouses proper; several of them contain as many as 400 hospital beds. The larger-sized infirmaries are excellent buildings, and both in structure and arrangement of wards compare favourably with the general civil hospitals, and if they were provided with a separate entrance apart from that to the workhouse, these institutions could be readily converted into municipal general hospitals, free of the present stigma of the Poor Law. I have visited many of these infirmaries, and have been surprised to find that the excellent bed accommodation which they provide *is only something like half occupied.* Realising how seriously inadequate is the general hospital accommodation of the area, with the low bed-rate of 0·76 per thousand of population, let me quote two or three instances from the survey of workhouse infirmaries.

In town "A," with a population of 119,000 (the centre of a Union population of 214,000), the hospital provision amounts to:—

One hospital of 60 beds for infectious diseases.
One „ 33 „ sick children (general).
One dispensary entirely for out-patients.
One workhouse infirmary of 400 beds.

Apart from the workhouse there is no general hospital provision for one single adult of the population. Yet in the workhouse infirmary of 400 beds, not more than 200 have been occupied during the past six or seven years. The nearest general hospital is three miles distant, so that the people of this town have to walk some six miles (to and from) to a neighbouring town for hospital treatment, passing on their way some 200 empty beds. During the year 1918 I find that there were 929 in-patients and 1273 out-patients—a total of 2202 patients—journeyed to the adjoining town to attend the general hospital.

In another town "B," with a population of some 60,000 (the centre of a Union population of 200,000), the following is the hospital provision:—

One general hospital of 50 beds.
One infectious diseases hospital of 56 beds.
One workhouse infirmary of 400 beds.

Here again the workhouse infirmary is an excellent hospital, with the most recent type of operating theatre: approximately not more than 200 of the beds have been occupied during the past six years. The committee of the general hospital have just launched a scheme to collect something like £100,000 to enlarge their hospital from 50 to 100 beds as a War Memorial, and yet, within a stone's-throw of this institution, stand 200 empty beds in the workhouse infirmary which could readily be separated from the workhouse proper.

Just one further illustration.

In town "C," with a population of 65,000 (the centre of a Union population of 87,000), the following is the hospital provision:—

One general hospital of 42 beds.
One workhouse infirmary of 360 beds.

At the general hospital the waiting list never falls below 100, and the Medical Officer of Health informed me that there were grave complaints from the medical men of the town of the gross inadequacy of the hospital accommodation.

The workhouse infirmary is an excellent hospital adequately equipped; the average occupation is approximately 60 per cent.

Many of these large workhouses have what are known as "school buildings" adjoining the infirmary. Since the Poor Law children were boarded out of the workhouses these school buildings have been unoccupied. At this last workhouse that I have quoted, the visiting Medical Officer who accompanied me gave me the assurance, as likewise did the workhouse master, that these empty school buildings could provide ample accommodation for all the infirmary inmates and thus release the infirmary wards with over 300 beds for use as a general hospital for the whole neighbourhood. These three illustrations abstracted from the survey report, revealing as they do the existence of hundreds of hospital beds lying dormant, surely more than justify the plea for a sanitary survey of the whole country.

While the whole region, therefore appears, at first sight, with its 1924 general hospital beds to be seriously under-hospitaled, yet the survey reveals an abundance of hospital provision, were it but put to its full use and properly co-ordinated.

Many of these workhouse infirmaries have attached to them an excellent maternity department of from 6 to 14 beds, but with an average number of only 16 confinements per annum. I suggest

that these beds might be made more use of, for there is in the whole region a serious need for maternity hospital accommodation. One Medical Officer of Health, speaking of his own locality, says: "There is no provision in the town—a centre of 200,000 population—for dealing with difficult confinement cases which in many instances necessitate operative treatment, and it is quite impossible that such assistance can be adequately given in the homes of the poor; a lying-in hospital for such cases is urgently needed."

Similar statements have been supplied to me by almost every Medical Officer of Health throughout the area, and not to maternity cases only, but to many of the other specialties, *e.g.* throat, eye, ear, etc.

For example, throughout the whole province with its two and a half million people there are only some 60 beds reserved for eye cases.

In one hospital report for 1918 the following sentence appears: "A great and increasing number of operations on squints, tonsils, and adenoids, etc., have been done and sent direct to their homes in cabs, etc., which ought in fairness to the patients to have been admitted for a few days—or at least 48 hours; but we have no beds we can give them, and to leave them as they are, means blindness in one eye in the squinting cases and an arrest of development in addition to increased risk of infection to all diseases, especially scarlet fever, diphtheria, in the adenoid cases." During the year 1918 the volume of work undertaken by the 39 general and special hospitals in the region is indicated by the following figures.—

	Hospital Patients.		
Approximately—	30,000 in-patients	= 1·2 per cent. of total population.	
	180,000 out-patients	= 7·2 „ „ „	
Total .	210,000	= 8·4 „ „ „	

These figures, which do not include the numbers of out-patient attendances, when taken in conjunction with the "waiting lists," give some idea of the popular estimate of hospital treatment.

Few things have impressed me more, throughout the survey than the inadequate and disappearing provision in the general hospitals for medical cases.

Medical v. *Surgical Cases in Hospital.*—The following figures

show the ratio of medical to surgical cases treated in some of the hospitals during 1918:—

Available Beds.	Total In-patients.	Percentage of Medical Cases to the Total.	Hospital.
466	9391	18·28	A
90	1134	12·6	B
73	1097	29·5	C
43	466	59·5	D
70	1050	6·3	E
78	1276	—	F
42	Two beds reserved	for medical cases.	G
14	195	10	H
236	3124	21	I

I do not pretend in this address to enter upon the full explanation of this exclusion of medical cases, but I would seriously submit for consideration the following observations. In the first place let me ask: Are our hospital beds at present being put to their best use?

In view of what has been said regarding the waiting lists the general cry of the hospitals for increased accommodation would from a surface view appear to be well founded. Hospitals are ever desirous of making increased accommodation for the reception of patients, but I suggest that the time has now arrived when this doctrine should be changed round to a consideration of the means of getting patients out of hospital.

The value of fresh air, or the sanatorium form of treatment, would appear to have been re-discovered in the military hospitals during the war. With their admirably arranged system of auxiliary hospitals, located in the country districts, the central military hospitals were able to overtake the great pressure of work that fell upon them, and at the same time the military patient had his recovery accelerated by a residence in the country.

When the civil surgeon goes round his wards he recognises many patients who have had their operative treatment a week or ten days previously, and who are now lying convalescing. I suggest that after say ten to fourteen days such patients might be transferred by motor ambulance to convalescent homes in the country, where the rate of convalescence would be accelerated by from 20 to 30 per cent., as compared with lying in a ward in the centre of some populous city amidst its noisy thoroughfares. The annual cost per occupied bed in such homes is approximately one-third to a half of that in the general hospital. In the Red Cross

auxiliary hospitals, the accounts of which have just been published, the average daily number of patients over four years of war (1915–1918) was some 38,000, and these were treated at a cost of 3s. 9d. per patient per day.

In the Annual Report of the Aberdeen Royal Infirmary for 1918 it is stated that in the Convalescent Hospital 281 cases were treated, and of these 251 "improved by residence," at an occupied bed cost of less than half of that in the Royal Infirmary. But what of the other 3000 odd in-patients? Is it unlikely that many of these also might have "benefited by residence" if they had been fortunate enough to get the opportunity? Of the 12,000 out-patients attending this hospital last year a fair percentage of them will ultimately qualify, by the progress of their ailments, to become in-patients, whereas by means of convalescent hospital treatment many might have their disease eradicated in the early stages.

Further, by such an arrangement as suggested of early transference from the wards to the auxiliary hospitals in the country, the urgently needed beds in the central hospital might be put to a fuller use, and the "waiting list" overtaken. This scheme should apply to medical as well as surgical cases. One well-known physician recently gave me his opinion that about 80 per cent. of his hospital patients would be better treated in the fresh air of the country. This scheme, of course, in order to keep up continuity of treatment, would imply periodic visitation by the medical officers from the central hospital, as was the case under the military system, and this naturally involved remuneration of the staff—a subject that I will refer to later on.

The most urgent need, therefore, of our general hospitals to-day is not so much the enlargement of the present expensive type of hospital buildings at a time when the resources of the country are severely strained, but rather a great development of the convalescent hospital system.

Now let me look for a further explanation of the exclusion of medical cases from the hospital wards.

Hospital beds, speaking generally, are in the main occupied by patients suffering from the fully developed or "end products" of disease, whereas the earlier phases of disease are to be found in the out-patient department, and yet this department is probably the least satisfactory branch of a general hospital. It is here where our most expert teachers should be located, rather than the junior assistant or, as happens occasionally, the resident house physician,

for it is in this department that the medical student meets the various types of disease that he is to spend his future life in treating. I suggest that we are not likely to make the progress in medicine that we ought to until the value of this out-patient department has been reassessed. When I look through the annual reports of hospitals—the most heart-breaking occupation I know of, owing to the absence of any common scheme for setting forth the facts as to the hospital work—one gets somewhat depressed in reading the records of the out-patient departments; hospitals seem to vie with each other as to who can show the largest number of out-patient attendances. At one hospital these attendances are given as 166,000 during 1918; at another 107,000, and so on! These figures may be intended to attract the subscriber, but as I say they must have a depressing effect on the mind of anyone who is interested in the progress of medicine, for after all there are only so many working hours in the hospital day, and it only requires a simple calculation to ascertain the number of minutes devoted to each patient.

Surely this is the department of all others in a hospital where research work ought to be carried out.

Let me very briefly refer now to the financial aspect of the hospital question. During the present month there has been appearing in the London *Daily Chronicle* a series of articles setting forth the serious financial position of the general hospitals throughout the country.

It was shown that some hospitals were overdrawn at the bank, others have had to sell securities and realise investments, while others have had actually to reduce the bed accommodation and shut down wards.

Various explanations were forthcoming of this financial crisis, such as (1) the falling off of subscriptions due to increased taxation and local rating, and (2) the increased cost of commodities and of salaries and wages.

These explanations, although important, I regard as only part of the truth, for the financial strain to many hospitals did not originate with the war. As I have already indicated, there has been for a number of years a steady change going on in the class of patients applying for hospital treatment. Originally restricted to the lower stratum of society—"the sick and lame poor"—the hospital subscription list was usually adequate to meet the annual expenditure, but now many hospitals draw their patients from a much broader basis of the community, without having secured a

proportionate increase in the number of subscribers; and further, apart altogether from the increased cost of everything in consequence of the war, the elaboration into departments of the whole system of medical treatment and operative surgery has been increasing the expenditure beyond the possibility of its being met by voluntary agencies.

The hospitals in London are more favourably placed than are similar institutions in the provinces, in that they have behind them a wealthy fund—the King Edward's Hospital Fund. This fund supplies grants to the hospitals on something like the following basis, viz.:—

1. The needs of the hospital and an estimate of the work done for the community.
2. The hospital has to adopt what is known as the uniform or standardised system of accounts.
3. An annual inspection by representatives of the fund.

These are not irksome conditions, and I trust the day is not far distant when the same fund or some similar Government subsidy will extend its operations to the provincial hospitals coupled with some co-ordinated system of central control. In our survey it has been ascertained that the 39 general hospitals had an income during 1918 of approximately a quarter of a million and an expenditure of some £200,000. During the war years the majority of civil hospitals, like the auxiliary Red Cross institutions, were in receipt of a Government subsidy supplied by the War Office for the treatment of military patients. These beds, formerly occupied by the paying military patients, are now occupied by non-paying people, and thus with the withdrawal of the subsidy the hospitals are finding their finances in a rather unsatisfactory condition.

In the hospitals surveyed, with the quarter million income for 1918 there were something like £36,000 received for the treatment of military patients, so last year cannot be regarded as normal; so far as the present year (1919) has gone, some of these hospitals which during the war were able to meet expenditure are now building up an adverse balance. Of the quarter million income, some 48 per cent. was subscribed by workmen employees and a further 19 per cent. was paid either by or for patients, *e.g.* military patients, pensioners, County Council payment for surgical tuberculosis, etc.

Very few of the hospitals reserve accommodation for *paying*

patients. This is an aspect of the subject calling for very serious consideration.

To-day the extremes in the social scale are well catered for as regards hospital provision, but between the private hospital at five guineas per week and the free general hospital there is practically no provision made for the great majority in each community of the so-called "middle class"—those who cannot afford the expense of the private hospital and yet who neither require nor desire to be pauperised by accepting the public charity. These people are ready and willing to pay, one, two or even three guineas per week for a bed in the general hospital: there would, naturally, be no difference in the treatment supplied, but if a patient desired some extra accommodation or luxury and willing to pay for it, one has a little difficulty in understanding why such hospital provision should not be supplied.

Payment of Hospital Staff.—The day would appear to be approaching when hospital managers will have to consider the question of paying a retaining fee to the medical men on the staff. No longer can the voluntary purist hold the field in the face of the principle now accepted of State payment for pensioners, including the payment of medical officers; the State payment for venereal disease and tuberculosis. Surely it is not illogical reasoning to argue from the payment of a staff for treating venereal disease to the payment of a staff for dealing with, say, fractures, hernia, etc. What is known as "team" work, although generally accepted in principle, has been very little adopted in the hospitals in this country. Each surgeon and physician on the staff ought to have a number of medical practitioners associated with him in his hospital duties. The staffing of the war hospitals throughout the country by the general practitioners, working in association with the various "chiefs," proved of inestimable value as a post-graduate course to the medical men employed; the freshened clinical instinct derived in the hospital was carried by these men in their general practice into the homes of the civil population.

Many other reasons might be given in support of the proposal for the payment of the medical staff, such as the fact that some hospitals, in their embarrassed financial position, gladly accept subscriptions from wealthy corporations, and under the guise of these subscriptions employees are sent for treatment to the hospital, and in this way the medical men giving their services voluntarily may be exploited.

Recently a wealthy corporation in London addressed to several

provincial hospitals a request for a reserve on a few of the hospital beds for the treatment of their employees when necessary, and asking the hospital what amount of subscription would be accepted; surely this is altogether a wrong principle. Again, in the course of my survey, I was informed of a shipping firm, owning several vessels, who obtained all necessary medical treatment for the crews of the vessels, including the captains, at the local hospital under cover of an annual subscription of a few guineas.

There are many other aspects of this survey full of interest and importance to hospital managers, the medical profession and the community at large, but I will only mention one other item in connection with the financial question.

One has long been under the impression that, next to the patients, those whom hospitals confer considerable benefits upon were the general insurance companies—accident offices in a direct manner and life offices indirectly. Just as in the case of fire, only more so in the case of life and limb, hospitals may be the means of greatly curtailing the amount of insurance compensation. Holding these opinions, I was rather surprised to find in our survey that of the annual income of the hospitals, amounting to a quarter million, the sum subscribed by these wealthy insurance bodies was less than £300 in one of the most prosperous years that accident insurance companies have experienced, namely 1918.

Allow me in conclusion to summarise some of the suggestions I would leave with you as to the hospital problems calling for early consideration, namely:—

1. The co-ordination of all hospital beds within a defined area; such an area as is served by the main central hospital; these beds would be under the supervision and management of a hospitals council whose office would act as a "clearing house" in all matters—financial and administrative—pertaining to hospitals.
2. A greatly increased provision of convalescent hospital accommodation.
3. The consideration of establishing "paying beds" or hospital provision for paying patients.
4. An investigation into the whole basis of hospital finance.
5. Establishment of "team" work in hospitals with payment of the medical staff.
6. A new appreciation of the out-patient department, both from the point of view of the patient and the medical student.

7. The establishment of a Hospitals Association for the purpose of instituting a hospital survey of the region or area; with sub-committees to investigate such aspects as—hospital accommodation and construction; hospital finance; staffing hospitals; nursing in hospitals; medical education and research; co-ordination of present organisations; co-operative buying, etc., etc.

OBITUARY.

JAMES CRAWFORD RENTON, M.D., F.F.P. & S.G., Late Surgeon and Lecturer in Clinical Surgery, Western Infirmary, Glasgow.

James Crawford Renton, who died in Edinburgh on the 21st of October, was a son of the Scottish Manse and was born in Auchtermuchty in 1851. He was educated at St. Andrews and studied in the University of Edinburgh, where he obtained the degree of M.B. in 1873, and M.D. in 1882. Following upon his M.B. he joined the resident staff of the Royal Infirmary as house surgeon to Dr. (afterwards Sir) Patrick Heron Watson, and it was probably then that his interest in surgery was awakened, for he was working under a very highly gifted chief and one of the most beautiful operators of his day. The following winter he spent in Paris and Vienna, and in 1874 settled down to general practice in Glasgow. He was shortly afterwards appointed to the staff of the Eye Hospital, upon which staff he served for many years. In 1876 his aptitude found a wider field for service, for he became assistant for out-patients to the Western Infirmary, and where, rising through successive grades, he was appointed in 1897 full Surgeon and Lecturer in Clinical Surgery, a position he held for seventeen years. On the declaration of war in 1914 he was posted with the rank of Lieut.-Colonel to the 4th Scottish General Hospital at Stobhill, near Glasgow.

In all these important and responsible positions he did excellent work, the results of which, and the experience gained, he communicated freely to the profession, for he contributed to many medical periodicals and has left behind him many valuable lessons. For many years he conducted a large general practice in the west end of Glasgow, and gained by so doing maybe the best foundation of experience for the operating surgeon, and that is the early and intimate knowledge of the emergency cases which for success in their treatment demand the most prompt interference, and thus it is that we find his most valuable teaching in connection with such lesions as produce the acute abdomen. Of all such lesions he had a large experience, and his success in dealing with them was notable, for he was as rapid in his diagnosis as he was ready in interference. He possessed in a high degree the clear perception and power of deduction which constitute the basis of correct diagnosis, and he had the clinical instinct which is the outcome of intimate and careful observation. He was a good surgeon; careful, deliberate, and courageous, for no incident upset him and no difficult procedure daunted him, for he had the knowledge and the experience which casts out fear, while his success was such as falls to the lot of

comparatively few. The surgeon who could write as he did—and this after a considerable experience in the operation—that excision of the Gasserian ganglion was "exceedingly safe and easy of performance," was gifted with manipulative skill and spirit of a high order. He was an excellent and popular teacher—one who took a warm interest in his students. He was a kindly and conscientious examiner in surgery; while as a man he was—and this most justly—very greatly beloved. One of his hospital colleagues writes to me thus: "Renton was one of the kindest men I ever met; his consideration for the poor, the distressed, and those who had fallen by the way, was constant, and no one has any idea of the gratuitous work he did." This from a colleague, and to me as one of his oldest friends, and when reviewing the wide fields of memory of more than a generation in years, there rises to remembrance those words spoken by Dr. John M'Crae, a distinguished worker in medical affairs, author of *In Flanders Fields*, who died on service in France: "It has often seemed to me that when on the Judgment those surprised faces look up and say, 'Lord, when saw we Thee an hungered and fed Thee, a thirsting and gave Thee drink, a stranger and took Thee in, naked and clothed Thee,' and there meets them the Warrant Royal of all Charity—'Inasmuch as ye did it unto one of the least ye did it unto Me,' there will be amongst those awed ones many a practitioner of medicine," and my belief is that James Renton will be present with them.

J. A. MacDougall.

CRITICAL REVIEW.

THE PROTECTION OF THE PERINEUM IN LABOUR.

By J. W. BALLANTYNE, M.D., F.R.C.P.E.

THERE are certain details in the management of obstetric cases which very seldom elicit articles in current medical literature; and yet it is not to be hastily concluded that on these details there exists full agreement and uniformity of practice. The scarcity of articles or their absence does not signify a lack of difference of opinion. This paradoxical state of affairs finds ready illustration in connection with the proper treatment to be followed when a portion of the membranes is known to be retained in the uterus after the expulsion of the placenta. A still better example is found in the ordinary every-day detail of the protection of the perineum in labour. The prevailing silence on this subject does not denote unanimity of practice among obstetricians; neither does it signify that the problem of the protection of the perineum in labour has been satisfactorily solved or that lacerations no longer occur. It is true that the Central Midwives Board has tried to unify the methods of saving the perineum from tearing and it is probably the case that all certified midwives pursue a somewhat similar plan of procedure—holding back the child's forehead in normal labours till the occiput is out from under the pubic arch (thus maintaining flexion) and endeavouring not to allow birth of the head during the acme of a pain. Yet this is only a seeming uniformity, and even when rigorously adhered to is not always successful; further, it breaks down in posterior positions and in other presentations than the vertex. Underneath the surface there is perhaps no part of the management of a labour regarding which less uniformity exists and less success is achieved than that which has to do with the care of the perineum; evidence of this is beginning to appear in recent text-books and even in periodicals devoted to obstetrics. It is the purpose of this critical review to examine into the present opinions on the subject so far as they can be ascertained.

Methods of trying to save the perineum from laceration may be divided into three groups. There is *first* of all the procedure which aims at leaving the perineum alone, allowing Nature, spelt with a capital, to negotiate the difficulty and trusting her to do the best possible. One has a shrewd suspicion that not a few doctors follow this plan of *non-interference;* and in actual practice many certified midwives owing to a degree of timidity or of self-restraint virtually do not interfere to any real extent with Nature's efforts. Plausible reasons

may be given for the practice of *laissez-aller:* it may be said that no ordinary pressure with the hands of the obstetrician can retard the birth of the head, and the statement is correct enough if the patient be fully conscious and if she has her feet pressing against the bedpost; it may also be said that pressure upon the perineum or attempts to direct the movements of the head may and often do bring about the very result (laceration) which it is the attendant's object to prevent. It is sometimes added that, after all, the perineum contains no important structures, that its laceration does not matter much so long as the levatores ani and the other muscles are intact, and that its repair is easily accomplished and is usually quite complete. Those who do not actively interfere with the birth of the head over the perineum may, however, adopt other safeguards: they may give chloroform so as to lessen the expulsive efforts, they may counsel the woman against bearing down when the head is in the vulvar ring, and they may encourage her to cry out; they may place her in a latero-prone position so as to diminish intra-abdominal pressure, and they may prevent too active flexion of the lower limbs and so relax the tension of the perineum. But even in this modified form the method of non-interference is not in favour with, at any rate, text-book writers and obstetric teachers. Munro Kerr[1] has no doubts on the subject: he writes, "left to Nature, lacerations of the perineum, more or less extensive, frequently occur—indeed, they are the rule; I have always carefully examined the perineum after delivery in cases of primiparæ, where the birth occurred spontaneously without any attention from nurse or doctor, and I have usually found lacerations." Other writers are less emphatic, but all tacitly at least suggest that Nature requires aid in bringing about the birth of the head. Even Dr. James Blundell, the great apostle some sixty or seventy years ago of "leaving things to Nature," in all his diatribes against "meddlesome midwifery," did not counsel that the perineum be left to itself. He wrote[2]: "when, under the natural efforts—with little interference on the part of the accoucheur—the head of the child at length comes down into the outlet of the pelvis, then it is that another and very important duty devolves on the accoucheur; namely, the protection of the perineum—a protection that, in some cases, is essentially necessary."

At the other extreme of obstetric practice from the *laissez-aller* plan is that of anticipating a traumatic laceration of the perineum by making a surgical incision. This may be called the *operative method* of dealing with the perineum; and the operation may take one of two forms. There is, first, *episiotomy*, the making of a lateral snick (unilateral or bilateral) in the vulvar margin. This plan has been in use for some time, but varying opinions are held as to its usefulness. Its purpose, of course, is to prevent an irregular and extensive median laceration which runs the risk of being infected, by making regular

short lateral incisions which do not extend further and which can be exactly sutured immediately after the birth of the head. No one probably goes so far as to practise episiotomy in all labours, although some may be tempted to do it in most primiparas; but most admit its value in exceptional cases. Thus Barton Cooke Hirst [3] recommends it in "great relative disproportion between the head and the vulva," but he adds "it is called for only in rare and exceptional cases," and he then, somewhat in self-contradiction, says, "personally I have no confidence in it whatever, as I believe it is based upon an incorrect idea as to the mechanism of pelvic tears." More recently [4] he states that if cutting the vulva at all he would rather do a median perineotomy than an episiotomy. Jardine [5] gives his opinion succinctly: "lateral incisions are advised by some, but I do not recommend them." Hastings Tweedy and Wrench [6] are not in favour of episiotomy: "You cannot be sure whether the perineum is going to tear or not, and if it does tear, when stitched, it will heal as well as a cut with the scissors." London, in this matter, is almost in line with Dublin: the Ten Teachers [7] say, "episiotomy is a practice only to be advised in exceptional cases." Edgar of New York [8] thinks that episiotomy "is indicated when delivery without severe perineal laceration is deemed impossible" (a rather indefinite indication), but "it is seldom necessary"; the incision should not exceed an inch in length and a quarter of an inch in depth; it should be made with blunt-pointed scissors, at a point about one-third of the distance from the posterior to the anterior commissure when the parts are on the stretch; and it should be done either at the beginning or towards the end of a pain. Munro Kerr [1] has laid down a simple rule for the performance of episiotomy; he incises the lateral wall if the posterior commissure of the vagina tears before the head has escaped to any extent; in other words, he uses it not to prevent but to arrest the median tear. R. W. Johnstone of Edinburgh [9] is of opinion that episiotomy is rarely necessary; and Galabin and Blacker [10] say that it is not generally desirable, but admit its advantages when rupture of the sphincter ani seems inevitable. Whitridge Williams [11] sees no advantage in the procedure. The writer of this critical summary is, unlike most of the obstetricians who have been quoted, very favourably impressed with the value of episiotomy, especially in primiparas, and he has used it with increasing frequency of late years. He believes he has often saved the median line by its employment. Of course the small lateral incisions must not be left unsutured, but catgut is usually sufficient. He would summarise his experience in the words, that whilst he has never regretted doing episiotomy he has now and again been sorry he did not do it.

The second surgical procedure for the perineum has only been recently introduced into practice under the name of *median perineotomy*. R. H. Pomeroy,[12] at the annual meeting of the American Gynecological

Society in 1918, read a paper with the interrogative and somewhat provocative title, "Shall we Cut and Reconstruct the Perineum for every Primipara?" He answered his question in the affirmative, and an interesting discussion followed, in which Hirst, Nicholson, Edgar, Polak, Gray Ward, jun., C. G. Child, and Harold A. Miller took part, all of them with the exception of Dr. Child being more or less in agreement with Dr. Pomeroy. Dr. Child preferred episiotomy because lateral incisions were easier to suture, and because cicatricial tissue in the median line was undesirable on account of its tendency to tear again. Pomeroy is careful to point out that median perineotomy was experimented with by the Germans and by other continental obstetricians some years ago, by Küstner (1892), Mandelberg, and Von Ott; Stahl of Chicago also, in 1895, advocated perineal section as far back as the sphincter ani. Median perineotomy, however, is a much more radical measure as practised by Pomeroy. Here are the directions he gives. "In a primipara promising spontaneous delivery and at definite establishment of 'crowning'—under brief nitrous oxide gas anæsthesia —we dilate the sphincter ani to three or four knuckles with sterile gloved hand—a little officinal tincture of green soap may be used as a lubricant. The labour is allowed to resume (gas or ether analgesia, of course, may proceed intermittently) until fissuring in the vagina, fourchette, or posterior commissure is evidenced on inspection or on note of trickling blood between pains. Such fissuring when observed prophesies an inevitable laceration of some degree—further delay should mean abandoning intent of median incision, as there is disadvantage in lacerations *plus* incision. With the patient completely under an anæsthetic and the head in recession a median incision is made with scissors, carrying the cut an inch or more up the columna rugarum posterior and externally nearly to the rectal mucosa. All tissues are severed to the rectal wall except the sphincter ani, and notably by nibbling snip rather than as in the classical oblique episiotomies by swift incision under tension. . . . The head is then coaxed out under complete control—the patient still anæsthetised—either by fundal pressure by an assistant or in the grasp of short forceps by the operator." Pomeroy states that perfect reconstruction of a median perineotomy is so simple as hardly to require description. He used chromic catgut for all sutures exposed on skin or mucous membrane and for buried sutures in the sphincter, whilst he employed plain catgut for all fully buried interrupted sutures (except in the sphincter); one or two supporting sutures of silkworm gut might be used as a safety adjunct in sphincter repair. The reference to sphincter repair will have been noted, and this requires a word of explanation: Pomeroy does not hesitate to practise complete median incision of the sphincter in the cases where he is in doubt as to the relative amplitude of the posterior sagittal diameter. No wonder Professor Edgar in his remarks

added, "I think we should emphasise what Dr. Pomeroy has said about his operation being a hospital proposition; theoretically, at least, it should be a hospital proposition." Thus we reach a rather strange and unlooked-for conclusion, viz. that "a first confinement is a distinct surgical proposition and that the operating-room should be its environment." In all truth we have travelled far in procedure from the days when it was considered sufficient to lay the palm of the hand flat on the perineum at the end of the second stage of labour! Are we really to divide the whole recto-vaginal septum in order to prevent it tearing in part? One is ready to admit the propriety of some such surgical procedure in desperate cases; but then one remembers Pomeroy's interrogative paper-title—"for every primipara." One sympathises with the surgical ambition felt by many to make as neat a job of labour as of, say, an appendicectomy; but dilatation of the sphincter followed by complete incision of perineum and possibly also of sphincter challenges inquiry and raises the question whether the perineum can be best protected by temporarily abolishing it, and that, as Mr. Pepys might have said, "seems pretty strange."

Midway between the two extremes of non-interference with the perineum and complete section of it lie the various plans of *protecting*, *preserving*, *guarding*, *supporting*, *saving*, or *simply caring for* the structure in question. These plans form the *third* group of methods for managing the close of the second stage of labour. Whilst they differ in details—a fact which can be recognised at once by the reading of eight or ten of the obstetric text-books in common use at the present time—they agree in the main. Thus they all aim at retarding the descent of the head over the perineum until the tissues of the latter have been sufficiently prepared to stretch without tearing and allow it to pass. This is commonly accomplished by manual pressure on the advancing head during the pains. Usually the patient is put on her left side and the obstetrician stands beside her with his left hand and arm passed over her right thigh and with his fingers applied to the occipital end of the fœtal head as it lies under the pubic arch; his right hand is placed directly on the more posteriorly-lying part of the head at the vulva. The mode in which the hands are worked differs slightly, but the main purpose is to retard the downward progress of the forehead (which lies posteriorly) until the occiput is well under the pubic arch. Whether or no gloves are used, whether the palms or the finger-tips are employed, and other details need not be inquired into. The object of this manœuvre is to counteract the commonest cause of perineal rupture—too rapid descent of the presenting part upon it. In the second place pressure, usually with the right hand, is brought to bear upon the forehead and brows through the skin behind and around the anus, so as to press the occiput against the symphysis pubis and to keep the whole head away from the perineum. The effect of this

manœuvre is to keep the head flexed, or, in other words, to encourage its escape from the vulva with its suboccipito-bregmatic diameter (the smallest possible) passing through. In this way it is hoped that the second cause of perineal laceration—the escape of the head in a more or less marked attitude of extension and therefore with larger diameters —will be avoided. Again there are small differences as to the way in which this is done; but all writers are agreed that the introduction of the fingers or thumb into the rectum and indeed any intrarectal interference is to be avoided and that there is to be no attempt to strip the perineum off the head. In the third place efforts are made to deliver the head between the pains or at any rate not to allow it to pass in the acme of a pain. For this purpose pressure with the fingers is made on the head in the pain, the patient's thighs are more or less extended and the knees brought together, the towel on which she has been pulling and the supports against which she has been pressing are taken away, and, if she is not under an anæsthetic, she is told to cry out. Then when the pain has passed off and the obstetrician judges the head may safely be expelled he extrudes it by pressure through the skin lying posterior to the posterior commissure, his fingers extending it and so shelling it out. In this way the third cause of perineal rupture may be in part at least avoided, viz. too rapid and too forcible passage of the head over it. Once again there are minor differences in technique, but the method is in the main what has been described.

It has to be confessed in regard to the third method of caring for the perineum that it does not suffice for the abnormal presentations and positions, for such anomalies as pelvic contractions (especially the funnel-shaped one), nor for the cases in which the head is relatively too large or too markedly ossified. Comparatively little attention is paid to these matters in most text-books, yet they are of great importance. Of course the careful employment of the means already referred to will help to prevent perineal rupture under these circumstances, but it will not ensure the safety of that structure; something more is needed. That something, the writer is convinced, may be supplied by the careful study of individual cases at the antenatal clinic. For instance, the detection of the posterior position of the head (a common cause of bad perineal tears) during the last weeks of pregnancy ought to lead to attempts by abdominal palpation to bring the occiput round to the front of the pelvis. If that plan fail, as it may do through want of mobility of the shoulders, then in the early part of the second stage of labour the whole hand should be passed up above the brim (under anæsthesia) and the shoulders and head brought round into an anterior position. Again the detection of overlapping of the symphysis pubis by the head or other presenting part as detected by abdominal palpation at the antenatal clinic ought to suggest the consideration of

the induction of labour before the disproportion of the passenger to the passages has gone too far; and this has to be thought of not solely to enable the head to get through the brim but also for the sake of saving the perineum. Similarly the detection of a face case either in pregnancy or early in labour ought to be followed by attempts at conversion of it into a safer presentation, again with the double purpose of giving easy passage to the head and of preserving the perineum. There are other circumstances in which timely interference will suggest itself, and all obstetricians in charge of antenatal clinics will discover them if they are on the watch for them. On the whole, however, these truly preventive methods of dealing with the perineum have been comparatively little considered.

It would appear, therefore, that some further study should be given to the care of the perineum. The third method has much to recommend it, and if occasionally supplemented by episiotomy (as Balfour Marshall [13] advises) the two plans in combination will often save the perineum. Prevention, however, is of great importance, and should, as pointed out above, begin before labour has commenced. Median perineotomy, on the other hand, requires careful consideration and scrutiny; it may have a sphere of usefulness, but a limited one.

REFERENCES.—[1] Munro Kerr, *Operative Midwifery*, 3rd ed., 1916, p. 669. [2] Blundell, James, *Obstetric Medicine*, 1840, p. 106. [3] Hirst, Barton Cooke, *Obstetrics*, 6th ed., 1909, p. 334. [4] *Ibid.*, *Trans. Amer. Gynec. Soc.*, 1918, xliii. 207. [5] Jardine, R., *Clinical Obstetrics*, 3rd ed., 1910, p. 174. [6] Hastings Tweedy and Wrench, G. T., *Practical Obstetrics*, 2nd ed., 1910, p. 57. [7] *Midwifery by Ten Teachers*, 1917, p. 297. [8] Edgar, J. C., *Practice of Obstetrics*, 4th ed., 1913, p. 887. [9] Johnstone, R. W., *Text-Book of Midwifery*, 1913, p. 161. [10] Galabin and Blacker, *Practice of Midwifery*, 7th ed., 1910, p. 648. [11] Whitridge Williams, J., *Obstetrics*, 2nd ed., 1908, p. 319. [12] Pomeroy, R. H., *Trans. Amer. Gynec. Soc.*, 1918, xliii. 201. [13] Marshall, G. Balfour, *Manual of Midwifery*, 1912, p. 146.

NEW BOOKS.

The Exact Diagnosis of Latent Cancer. By O. C. Gruner, M.D. Pp. viii + 79. With 19 Illustrations. London: H. K. Lewis & Co., Ltd. 1919. Price 7s. 6d. net.

The author of this book has evidently carried out very extensive and painstaking investigations on the state of the blood in cancer and other cases. He has, however, expressed his findings in a terminology so complicated, and has clothed his subject with a language so essentially his own, that the average reader will turn to a text-book of advanced trigonometry with a sense of relief. Whilst it cannot be denied that the author may in his minute researches have discovered factors peculiar to the blood of cancer patients, it is certain that his methods and formulæ will require to be simplified before they can be of much practical value.

Transactions of the American Gynecological Society. Vol. XIII. for the Year 1918. Pp. lx + 480. With 76 Illustrations. Wm. J. Dornan, printer. 1918.

The American Gynecological Society maintains a vigorous life, as is evidenced by its annual volume of Transactions for the year 1918—a year, be it noted, when America was at war. Under the presidentship of Professor John G. Clark of the University of Pennsylvania, and with Professor George Gray Ward of Cornell University as secretary, the forty-third annual meeting was held at Philadelphia in May 1918, and a full and interesting programme was successfully carried through. The president's address dealt with "Medical Teaching and Research after the War," and it contained not a few refreshingly frank statements, such as that about America's opportunity for making advances in obstetric research with the European nations all impoverished and their educational systems suffering. He had sent out a circular letter to ascertain the views of leading instructors on the relationship of obstetrics to gynecology and of both to surgery; all the answers were opposed to the incorporation of gynecology within the department of general surgery, and the president thought that "so long as a professor of obstetrics and gynecology attempts to engage actively in the practice of these two branches, just so long will both branches continue to suffer, for it is physically impossible for anyone to undertake so heavy a task successfully." He had also a strong word to say on post-graduate work: "The wretched post-graduate instruction of past years should be discarded and courses arranged of such essential value that upon

their completion by a student his diploma will be a real and trustworthy evidence of ability in that special branch."

There are many other articles in the volume to give food for serious thinking. Among these may be named Professor Edgar's "Why the Midwife?", Dr. Foulkrod's paper on the "Obstetrician's Responsibility for the Conservation of Infant Life," Dr. Pomeroy's revolutionary suggestion to cut and reconstruct the perineum for every primipara, and Professor Howard Kelly's paper on 210 fibroid tumours treated by radium, with results which should give a heavy shock to the hysterectomist. Articles on less controversial matters were those by Dr. Arthur H. Curtis of Chicago on the "Bladder of Women after Operation," of Dr. Fred L. Adair on "Ossification Centres of the Fœtal Pelvis," of Dr. E. A. Schumann on "Dystrophia Adiposa Genitalis in Women," and of Dr. Guy L. Hunner of Baltimore on "Elusive Ulcer of the Bladder." The volume contains much to interest both the specialist and the general practitioner, and is well up to the standard of pre-war years.

FOREIGN BOOK.

La Toxémie Traumatique. By R. QUÉNU. Pp. 141. Paris: Librairie Félix Alcan. 1919. Price frs. 6.60.

THE distinguished author of this treatise is well known for his advocacy of the toxæmic origin of shock. To all who are interested in the subject this book will give a very succinct and yet comprehensive exposition of the evolution of the various theories. After an historical survey, the author marshals the evidence gathered during the war by workers from front line to base hospital and analyses the factors which play a part in the production of wound shock.

Whilst not minimising the importance of fatigue, cold, and loss of blood, he brings forward considerable evidence in favour of the theory that the state of shock which develops some hours after injury is of the nature of a toxæmia from absorption of toxalbumins from the damaged tissues, particularly the muscles. He admits that very frequently infection plays a part in producing the toxæmia, probably by the bacteria acting as the agent causing the rapid proteolysis of the damaged muscles. Numerous instances are cited in which removal of the damaged tissues by excision or amputation has led to a disappearance of the symptoms of shock.

The chapter on the treatment of shock gives an interesting summary of the results obtained by various workers in the allied armies.

The book is a valuable contribution to the literature of wound shock.

NEW EDITIONS.

A Short Practice of Medicine. By ROBERT A. FLEMING, M.D. Third Edition. Pp. xxiv + 675. London: J. & A. Churchill. 1919. Price 21s. net.

THE favourable reception which this text-book has obtained in the past will certainly be extended to the new edition. The book follows conventional lines—the only possible plan when its object is considered,—and it may be said with confidence that any student who makes diligent use of it need have no fear when he comes to face an examiner. This edition has been thoroughly revised, and short sections on war diseases—shell shock, trench fever, nephritis, trench feet, etc.—have been added. In previous reviews of Dr. Fleming's book his methodical array of the different points in connection with disease as the student is expected to know them has been remarked on, and this feature remains in the present edition. There can be no doubt that it facilitates the student's work. Another good feature of the book is the balance between the different subjects. The author has avoided the temptation of devoting too much space to subjects he himself is interested in, and gives to each its proper due in impartial fashion. In reading through various chapters we have found little to criticise, and no inaccuracies. It seems to the reviewer, however, that the sections on neurasthenia, hysteria, and cognate neuroses are not up to the level of modern teaching, and that even for a student more prominence should be given to the modern views of their etiology and therapeutics.

The book has been out of print for nearly two years, and thus the third edition is assured beforehand of a double welcome.

Manual of Anatomy. By A. M. BUCHANAN. Fourth Edition. Edited by E. BARCLAY SMITH, J. ERNEST FRAZER, F. WOOD JONES, F. G. PARSONS, W. WRIGHT. Pp. xii + 1743. With 677 Illustrations. London: Baillière, Tindall & Cox. 1919. Price 30s. net.

THE fourth edition of Buchanan's *Manual of Anatomy* is well printed, well bound, and some of its descriptive parts, in the sections which are dealth with systematically, are very good, but it cannot be recommended to the student of anatomy of the present day who has any outlook to the future, for it uses what the editors call the "old nomenclature," which year by year is falling more and more into

disuse, in the majority of the English-speaking schools, because it causes the student, in many cases, to learn more than one term for one structure and, therefore, unnecessarily increases his work and the possible causes of his confusion, whilst, in addition, it uses the terms in such a way that the definition of the relative positions of various structures to one another is made obscure.

There is also another objection to the use of the book. It is an attempt to combine a manual of practical anatomy with a text-book of systematic anatomy—a happy combination if it is thoroughly carried out; but in spite of the attempt the reader of this *Manual* will obtain no consecutive account of important structures and will have to search through many different pages for a full survey.

Here and there there are some striking errors of description which have escaped the editors and which will no doubt be eliminated in subsequent editions, together with the numerous B.N.A. terms, to which the editors have such a strong objection but which are incorporated in the present edition.

Essentials of Physiology. By F. A. Bainbridge and J. Acworth Menzies. Third Edition. Pp. 484. London: Longmans, Green & Co. 1919. Price 12s. 6d. net.

It is a pleasure to welcome the third edition of this excellent text-book.

It is moderate in size and at the same time gives an adequate presentment of its subject. It is clearly written and well illustrated. Photographs of cases of acromegaly, myxœdema and exophthalmic goitre are reproduced, and the clinical side of physiology has not been overlooked.

The book is one which we cordially recommend to the student of medicine.

Text-Book of Physiology. By W. H. Howell. Seventh Edition. Pp. v + 1057. Philadelphia and London: W. B. Saunders Co. 1918. Price 21s. net.

The seventh edition of this well-known text-book has been thoroughly revised but is not altered in essential features.

The rapid succession of new editions is sufficient evidence of its popularity. This is the more remarkable since the reading of over a thousand pages of fairly closely printed matter is no light undertaking for the average student of medicine who has a full diet of text-book lore to assimilate.

We have the greatest admiration for the clearness, accuracy, and style of this book, but confess that we think the student of medicine could get all the physiology he requires in much smaller compass.

On Longevity and Means for the Prolongation of Life. By Sir HERMANN WEBER, M.D, F.R.C.P. Fifth Edition. Edited by F. PARKES WEBER, M.D., F.R.C.P. Pp. xvi + 292. London: Macmillan & Co. Price 12s. net.

THIS well-known book had its origin in a lecture to the College of Physicians in 1903. This fifth enlarged edition was in the printers' hands when the author's death took place, and now appears with a short editorial preface by his son, Dr. Parkes Weber. It also carries a preface by Sir Clifford Allbutt, which is at once a full and witty commentary on the main points of the book, and a warm tribute of friendship.

The book covers wider ground than its title indicates, and is really a *regimen sanitatis*—a collection of rules and precepts for wise and healthy living. Sir Hermann Weber believed that after several generations of strict adherence to his sanitary code the life of man might be prolonged to a hundred years, would be a much happier and finer thing, and would terminate by an easy and sleeplike death. The title-page bears the motto: "Work, Moderation, and Contentedness are the main sources of happiness and long life," and this is the short text round which the book is written. Steady, assiduous application to work, temperance in eating and drinking and sleeping, the cultivation of a cheerful and calm temper, regular daily exercise in the open air for two to three hours, strict attention to the hygiene of the skin—these are the golden rules by which health of body and vigour and happiness of mind can be maintained into advanced age. The book, written by an old man, breathes an air of sunny optimism. Sir Thomas Browne has nobly described the mood of an old man as of "one, who having been long tost on the wild ocean of this world, begins at length to feel the indraught of another." But in the ideal old age of this book there is none of this tiredness of life. The book is a very wise and pleasant essay on health by a physician rich in experience of life and of the causes and conditions that mar it.

Vicious Circles in Disease. By JAMIESON B. HURRY, M.A., M.D. (Cantab.). Third Edition. Pp. xvi + 337. With 22 Illustrations. London: J. & A. Churchill. 1919. Price 15s. net.

THE first edition of Dr. Hurry's book appeared eight years ago, and the present volume is both increased in size, and also enlarged in its scope by the inclusion of chapters dealing with vicious circles in animal and plant pathology. After discussing the history and definition of the term "vicious circle" and the almost universal occurrence of the condition in living organisms, the author gives a large collection of examples in the various systems and regions of the human body. In

each chapter the more important examples are also diagrammatically represented. Two chapters are also devoted to instances where this vicious process of progressive interaction is spontaneously broken by nature, or is interrupted by therapeutic measures, hygienic control, drugs, or surgical intervention. The text throughout is interspersed with numerous quotations from medical literature. The frequent mention of the term in medical writings is a proof of the importance of the process in disease, both from the point of view of pathology and therapeutics, and Dr. Hurry has done a useful service in devoting a monograph to the subject. The appearance of this third edition will be welcomed.

A Medical and Surgical Help for Shipmasters and Officers in the Merchant Navy. By Wm. Johnson Smith, F.R.C.S. Revised by Arnold Chaplin, M.D., F.R.C.P. Fifth Edition. Pp. xviii+355. London: Chas. Griffin & Co., Ltd. 1919. Price 6s. net.

This well-known work serves a useful purpose in the Merchant Navy, but in a work "carefully revised" it is surprising to find that of "the two methods of imitating breathing" Sylvester's is advocated as "preferable"; Schafer's method—at once so much more easily performed and efficient—is not even mentioned. The definition (p. 143) of a compound fracture is very inadequate, and a "plaster of Paris or starch bandage around the joint" is surely unwise treatment for a sprained ankle. The description of the treatment of fractures (*e.g.* Colles') is very unsatisfactory, and the great importance of early movement and massage in bone and joint injuries is nowhere emphasised. The author does not realise that the patient may be for weeks dependent upon his ship captain's treatment.

Practical Physiological Chemistry. By Sydney W. Cole, M.A. Fifth Edition. Pp. xvi+401. With 55 Illustrations. Cambridge: W. Heffer & Sons, Ltd. 1919. Price 15s. net.

As stated on the first page, the present is a completely revised and enlarged edition of this well-known and useful little class-book of practical physiological chemistry. It is, in reality, a new and different book, alike in its conception and its object. Whether this is altogether a gain is not easy to decide; on the large side as a working guide for elementary students, it yet makes no claim to the completeness associated with a work of reference.

This notwithstanding, it will be found a useful book both for students, elementary and advanced, and for research workers, who, to quote the preface, are not specially versed in chemical technique, and

who wish to apply a method to medical or biological problems. A noteworthy feature of the book is the courage displayed in abandoning old and unsatisfactory methods where necessary, and the inclusion in other cases of many modifications of historical methods, which modifications have proved advantageous in actual practice. Some of the latter are undoubtedly original; others embody improvements which have been more or less generally adopted, though perhaps not placed on record; among these, *e.g.*, is the modified Kjeldahl method for total nitrogen.

The general arrangement of the subject-matter, the clear and unambiguous directions, and the explanatory notes on theoretical and practical difficulties, are, as before, worthy of all praise. Some of the illustrations appear unnecessary, while others, again, are not altogether satisfactory; and, as has been unfortunately all too common since the war, the number of slight but irritating typographical errors is much larger than one could desire.

It must not be inferred from these slights defects that this edition on the whole does not mark a distinct advance. In addition to the changes already mentioned, attention may be directed to the sections on neutrality and the use of the new indicators, on the acidity of urine, on the examination of enzymes, on the non-protein nitrogen of the blood, and, most important of all, to the careful exposition of quantitative methods, and especially of the so-called micro-methods. In this connection there is a curious slip—the torsion balance, which is useful where a large number of weighings of small quantities are to be made and no great accuracy required, is referred to as a micro-balance; a term already and rightly applied to the instrument devised by Nernst.

Fevers in the Tropics. By Sir LEONARD ROGERS, C.I.E., M.D., F.R.C.P., F.R.C.S., F.R.S., Lt.-Colonel, I.M.S. Third Edition. Pp. xii + 404. With 96 Illustrations. London: Henry Frowde and Hodder & Stoughton. 1919. Price 30s. net.

THE third edition of this book supplies evidence both of the enormous advance made recently in our knowledge of tropical diseases and of the untiring energy of the author. There are few men engaged in active service in the tropics who can spare the time and effort which must have been ungrudgingly bestowed in the revisal and re-writing of which this new edition bears evidence on nearly every page. There is no appearance of the "lethargy of the East" in the case of Sir Leonard Rogers.

Perhaps the greatest regret of the reader will be the fact that he will look in vain for the pages which should be taken up with an account of the dysenteries. These are to be found in another volume

by the same writer. Might it not be possible to put the two books together as two volumes of tropical fevers?

An excellent and complete account of kala-azar is contained in the first part of the book, not the least useful pages being devoted to the methods of diagnosis between chronic malaria and kala-azar. The value of the sodium antimonyl tartrate method of treatment for kala-azar is of the greatest interest.

The chapter on trypanosomiasis and sleeping sickness is admirable, and the latest methods of dealing with the latter disease are exact and convincing. One notes the stress laid on the very atypical temperature charts of many cases of typhoid fever in the tropics.

Perhaps one of the most interesting parts of the book is the account of amœbic hepatitis which, notwithstanding the omission of dysentery, has been included. The table of cases on page 186 is certainly by no means convincing; and the reader will probably conclude that the cases without dysentery treated with ipecacuanha, and with success, were really, one and all, amœbic. Nevertheless, the great value of a marked leucocytosis as an indication of amœbic hepatitis going on to liver abscess is beyond doubt.

The author's strong advocacy of full quinine treatment in malaria both for preventing relapses and preventing the infection of uninfected anopheline mosquitoes is of special interest at a time when malaria occupies such an important place after the war. Perhaps too little stress is laid on the dangers of the hypodermic treatment of malaria by quinine, and little is said in favour of the intensive treatment, intravenous and intramuscular, in cases of cerebral malaria.

The illustrations are extremely good, the temperature charts are chosen with much judgment, and the literature at the end of each section is most comprehensive. Generous reference is made to the researches of other specialists in tropical diseases.

Principles and Practice of Obstetrics. By Joseph B. DeLee, A.M., M.D. Third Edition. Pp. xv + 1089. With 949 Illustrations. Philadelphia and London: W. B. Saunders Company. 1918. Price 31s. 6d. net.

The appearance of three editions of this work during the past five years is a witness to its high standard. There are in this edition some additions and alterations, and the book is brought up to date.

It is doubtful if we can find anywhere a more complete and a more satisfactory text-book on obstetrics than this well-known work. The purely scientific and the practical aspects of the subject are each dealt with fully, and the combination is throughout judicious and well balanced. There are copious references to the literature, but through-

out the work bears the impress of a singularly original mind working on a big experience.

The illustrations are a valuable feature of the work. Of this side it is impossible to speak too highly. In the last chapter on obstetric operations the details of the operation can be best studied direct from the illustrations with the aid of the full legends which are provided.

In such a wealth of material it is difficult to specify any particular chapters. In most cases the author's view-point is well reasoned, though it may not always convince. For instance, in a valuable chapter on placental infarcts he describes hæmorrhage as occurring into an infarcted area. He does not make it clear how this can take place. In his discussion of retro-placental hæmorrhage the author omits to refer to the well-authenticated occurrence of placental disease as secondary to the bleeding.

The author's opinion on contesting lines of treatment is always valuable. For instance, he favours the Cæsarean section of Krönig, *i.e.* through the lower uterine segment, as against the classical operation, except in fibroids, placenta prævia, and cases necessitating a Porro. He believes that the new operation will soon displace the high operation as the results are uniformly better.

The book is too large for the ordinary student working for examinations. It is more adapted to the needs of the practitioner and the specialist.

The Organs of Internal Secretion. By J. G. Cobb, M.D., M.R.C.S. Second Edition. Pp. xii + 274. London: Baillière, Tindall & Cox. 1918. Price 7s. 6d. net.

This work is written with the object of introducing the busy general practitioner to the practical clinical aspects of diseases affecting the endocrine glands. That the author has gauged the need for a book of this kind appears from the fact that this second edition has been called for a little over a year after the first. The entire book has meantime been carefully revised and brought up to date. A chapter dealing with the relation of the internal secretions to functional nervous diseases has been added. The articles on thyroid anomalies are good, although space might have been found for a description of various forms of non-toxic goitre and the neoplasms of the thyroid.

In the sections dealing with pituitary, adrenals, etc., the author has stated briefly and clearly what will be of practical interest to the busy general practitioner. For this class of reader the articles on treatment will be found useful, and no harm will result from the tendency to speculative suggestion in which the author inclines to revel. A few well-selected illustrations would greatly enhance the usefulness of this book.

Differential Diagnosis: Presented through an Analysis of 317 *Cases.* By Richard C. Cabot, M.D., Assistant Professor of Clinical Medicine, Harvard University Medical School. Volume II. Second Edition. Pp. 709. With 254 Illustrations. Philadelphia and London: W. B. Saunders Company. 1918. Cloth, 25s. net.

This work occupies an unique position amongst books which deal with differential diagnosis, because throughout it adopts a system of teaching by means of selected medical cases. To the consideration of each important symptom one chapter is devoted: it commences with an enumeration of the possible causes, together with suggestions for investigation of the case. This is followed by a series of case-illustrations taken from actual practice. All the examples are carefully selected, the outlines given are full and concise, and they admirably illustrate the various points for which they are intended. Excellent practice in differential diagnosis can be obtained by the consideration of any of the cases individually: after reading the history, symptoms, and physical signs, the practitioner should form his own opinion as to the possible explanation, and this can afterwards be checked by reading the course and termination. The work throughout is written in an easy style and is full of interest. It is complete, but not so exhaustive as to become monotonous. The present edition differs little from the original, but it contains a small amount of new matter and has been revised throughout. It can be recommended to all interested in the subject of medicine. The printing and general production of the volume is of a high standard.

BOOKS RECEIVED.

American Frohse Life-Size Anatomical Charts	(*W. & A. K. Johnston*)	—
Burke, E. T. The Venereal Problem	(*Henry Kimpton*)	7s. 6d.
Holmes, G. W., and H. E. Ruggles. Roentgen Interpretation .	(*Henry Kimpton*)	15s.
Levinson, A. Cerebro-Spinal Fluid	(*Henry Kimpton*)	18s.
Pedersen, Victor Cox. A Text-Book of Urology	(*Henry Kimpton*)	36s.
Sargeant, F. Pilkington. Elementary Organic Chemistry. Second Edition	(*H. K. Lewis & Co., Ltd.*)	4s.
Wimmer, August. Psychiatric Neurologic Examination Methods	(*Henry Kimpton*)	10s. 6d.

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MEDICAL EDUCATION IN SCOTLAND.

According to the Regulations of the General Medical Council, a candidate for a medical qualification must (1) pass a preliminary examination ; (2) register as a medical student ; (3) study for five years at a recognised school ; (4) obtain a degree or diploma ; and (5) place his name on the *Medical Register*. No person whose name is not on the *Register* may legally sign certificates, give medical evidence in Courts, or sue for fees.

The following degrees and diplomas are available in Scotland :—Bachelor of Medicine and Bachelor of Surgery (M.B., Ch.B.), conferred by the Universities. Doctor of Medicine (M.D.) and Master of Surgery (Ch.M.) are higher qualifications conferred only on those who already hold the M.B., Ch.B.

The *Triple Qualification* (L.R.C.P.E., L.R.C.S.E., L.R.F.P.S.G.) is conferred by the two Royal Colleges and the Royal Faculty jointly. The Fellowships, Memberships, and Licences of these Corporations may also be registered as higher or additional qualifications.

Special degrees and diplomas in public health are also granted by the Universities and Corporations.

THE UNIVERSITIES.

Preliminary Examination.—Before commencing his course of medical study each student shall pass a preliminary examination in (1) English, (2) Latin, (3) Mathematics, and (4) an additional language—Greek, French, German, Italian, or such other as the Senatus shall approve. In the case of a candidate whose native language is other than English, an examination in another classical language—*e.g.* Sanskrit or Arabic—may be substituted for Latin, and an examination in the candidate's native language may be substituted for the additional language. A student must pass all the subjects at not more than two examinations. A degree in Arts or Science of any recognised University exempts from the preliminary, and certain other examinations may be accepted as substitutes.

Matriculation.—Having passed the preliminary examination, the student must, within fifteen days after the commencement of the session, matriculate at the University and pay the fee, which is £1, 1s. for the whole year, 10s. 6d. for the summer session alone.

Registration.—Within fifteen days of commencing his studies he must register as a medical student. He must be not less than sixteen years of age, must have passed the preliminary examination, and must show that he has begun his medical studies.

The Carnegie Trust.—This Trust is prepared to pay a portion of the class fees of students (who have passed the specified preliminary examination) for all classes, whether attended within the Universities or in any of the Extra-mural Schools. It is also prepared to pay the fees for the various special classes given by many of the Lecturers upon advanced and non-compulsory subjects. Applicants (1) must be over sixteen years of age ; (2) must be of

Scottish birth or extraction, or must have given two years' attendance after the age of fourteen at a school or institution under inspection of the Scottish Education Department; and (3) must be qualified by preliminary examination under the ordinances of the Scottish Universities Commission and the regulations of the Scottish Universities Entrance Board, to attend the classes for which payment of fees has been claimed. Schedules of application for admission to the benefit of the Trust are obtainable by written application to the Secretary of the Trust, 22 Hanover Street, Edinburgh.

UNIVERSITY OF EDINBURGH.

The University of Edinburgh offers many attractions to the student of medicine. The various departments are well equipped for purposes of teaching and research, and there are ample facilities for clinical instruction. The Royal Infirmary, the Royal Hospital for Sick Children, and the Royal Maternity Hospital are in the immediate vicinity of the University, while the Royal Asylum for the Insane, the Fever Hospital, and the various dispensaries can be reached within half an hour.

Students may attend one half of their classes in the Extramural School, and are thus offered a choice of teachers on the different subjects of the curriculum.

An important agreement between the University and the Royal Infirmary has been reached by which the teaching resources of the latter are more fully available for University students than formerly. The agreement provides that all the senior members of the Infirmary staff (those in charge of wards) become senior University lecturers and examiners, while the assistant physicians and surgeons become University lecturers, and take a share in the clinical teaching. The clinical tutors also take a recognised place in University teaching, and the medical demonstrations are held at a morning hour instead of in the evening.

Since the war broke out a very large number of students and several of the teachers have joined His Majesty's forces. The reduction in numbers has been somewhat proportionate, and with a little rearrangement the teaching has been adequately maintained.

The social side of student life is provided for in many ways. The University Union, with a membership of 1500, has a debating-hall, a library, reading rooms, billiard rooms, and a catering department.

The Royal Medical Society, founded in 1737, offers the student the advantages of an extensive medical library and reading rooms, while in its spacious hall many whose names have since become famous have made their first essay in medical debate. The Australasian Club and the South African Union are the headquarters of students from these parts of the Empire.

The Town and Gown Association provides a number of student residences, which are managed by a committee of the residents.

Women students are now admitted to the systematic lectures and practical classes within the University and to the clinical classes in the Royal Infirmary.

Under a recent regulation attendance on classes of instruction in the various special departments is compulsory. This change has necessitated a rearrangement of the curriculum, and an important regulation was introduced which has the effect of limiting a student's attendance on later subjects of the curriculum until he has passed the professional examinations on the earlier subjects.

Particulars regarding the curriculum will be found in the University calendar or "medical syllabus," published by James Thin, 55 South Bridge.

It is recommended that students begin study in the Summer Session. The curriculum is as follows :—

FOR STUDENTS BEGINNING IN SUMMER.

First Summer Term—	Hour of Meeting of Class.
Botany	8-9
Zoology	12-1
Practical Botany } On alternate days {	9-11
Practical Zoology } On alternate days {	10-12
Practical Anatomy (thrice weekly)	Afternoon

(*Examination in Botany and Zoology.*)

First Year.

Winter (1*st Term*)—	
Practical Chemistry (twice weekly)	9-11
Anatomy	11-12
Chemistry	12-1
Physics[1]	1-2
Practical Anatomy	Afternoon
Winter (2*nd Term*)—	
Practical Chemistry (twice weekly)	9-11
Anatomy	11-12
Chemistry	12-1
Physics[1]	1-2
Practical Anatomy	Afternoon

(*Examination in Chemistry and Physics.*)

Summer Term—	
Histology	8-10 or 11-1
Practical Anatomy.	

Second Year.

Winter (1*st Term*)—	
Physiology	10-11
Practical Physiology (twice weekly)	11-1
Practical Anatomy and Demonstrations.	
Winter (2*nd Term*)—	
Physiology	10-11
Practical Physiology (twice weekly)	11-1
Practical Anatomy and Demonstrations.	

(*Examination in Anatomy and Physiology.*)

Summer Term—	
Pathology (Practical) (thrice weekly)	8-10
Pathology (Morbid Anatomy)	10-11
Surgical Out-patients	11-12
Clinical Surgery	12-2
Practical Materia Medica	Various hours

Third Year.

Winter (1*st Term*)—	
Medicine	9-10
Pathology (Morbid Anatomy)	10-11
Clinical Medicine	11-1
Materia Medica	2-3
Pathology (including Elementary Bacteriology)	3-4
Practical Materia Medica	4-5

[1] The class of Physics meets thrice weekly during the Winter Session.

Winter (2nd *Term*)—			Hour of Meeting of Class.
Medicine			9-10
Pathology (Morbid Anatomy)			10-11
Clinical Medicine			12-1.30
Materia Medica			2-3
Pathology (including Elementary Bacteriology)			3-4
Practical Materia Medica			4-5

(*Examination in Pathology and Materia Medica.*)

Summer Term—			
Out-patients (Medical)			11-1
Vaccination			3-4
Dispensary Practice			Afternoon

Fourth Year.

Winter (1st *Term*)—			
Surgery			9-10
Midwifery (including Gynecology)			10-11
* Sec. A. Diseases of Skin * „ B. Diseases of Eye * „ C. Diseases of Ear, etc.	11-12	Clinical Surgery	12-2
Dispensary Practice. Infectious Diseases (once weekly) Anæsthetics.[1] Optional Classes.[2]			Afternoon

Winter (2nd *Term*)—			
Surgery			9-10
Midwifery (including Gynecology)			10-11
Sec. A. Diseases of Ear, etc. „ B. Diseases of Skin „ C. Diseases of Eye	11-12	Clinical Surgery	12-2
Mental Diseases (twice weekly)			3-4
Infectious Diseases (if not previously attended) Dispensary Practice Practical Midwifery			Afternoon

Summer Term—			
Operative Surgery			8-9.45
Public Health			10-11
Sec. A. Diseases of Children			11-1
„ B. Diseases of Ear, etc. „ C. Diseases of Skin	11-12	Clinical Medicine	12-1.30
Forensic Medicine			2-3
Infectious Diseases (if not previously attended)			Afternoon

(*Examination in Forensic Medicine and Public Health.*)

* These classes are held thrice weekly, and on remaining days students must attend Clinical Surgery at 11 o'clock.

1 A course of instruction is given in each term.

2 Optional courses are held in the subjects of *History of Medicine* (during the First Term of the Winter Session, twice weekly, 4 to 5 P.M., and may be attended by students who have passed the 1st Professional Examination); *Physical Methods in the Treatment of Disease* (during the First Term of the Winter Session, 4 to 5 P.M., twice weekly, and open to students who have passed the 3rd Professional Examination); *Neurology* (daily at 4 P.M. during the Second Term of the Winter Session, and open to students who have passed the 3rd Professional Examination); *Applied Anatomy* (thrice weekly, from 5 to 6 P.M. during First Term of Winter Session, and students are recommended to take the class in the Fifth Winter).

Fifth Year.

	Hour of Meeting of Class.
Winter (*1st Term*)—	
Tuberculosis	9-10
Clinical Gynecology	10-11
Sec. B. Diseases of Children	11-1
„ A. Diseases of Eye 11-12 Clinical Medicine	12-1.30
„ C. Clinical Medicine or Clinical Surgery.	
Dispensary Practice, Practical Midwifery	Afternoon
Optional Classes.	
Winter (*2nd Term*)—	
Clinical Gynecology	10-11
Sec. C. Diseases of Children	11-1
Secs. A. and B. Clinical Medicine or Clinical Surgery	12-1.30
Dispensary Practice, Practical Midwifery if not previously attended	Afternoon
Summer Term—	
Tuberculosis	9-10
Clinical Work in Hospital.	

(*Examination in Midwifery, including Gynecology, Surgery, and Medicine, and corresponding Clinical Examinations.*)

FOR STUDENTS BEGINNING IN WINTER.

First Year.

Winter (*1st Term*)—	
Practical Chemistry (twice weekly)	9-11
Anatomy	11-12
Chemistry	12-1
Physics	1-2
Practical Anatomy (thrice weekly)	Afternoon
Winter (*2nd Term*)—	
Practical Chemistry (twice weekly)	9-11
Anatomy	11-12
Chemistry	12-1
Physics	1-2
Practical Anatomy (thrice weekly)	Afternoon

(*Examination in Chemistry and Physics.*)

Summer Term—	
Botany	8-9
Zoology	12-1
Practical Botany, Practical Zoology on alternate days	9-11
	10-12
Practical Anatomy	Afternoon

(*Examination in Botany and Zoology.*)

Second Year.

Winter (*1st Term*)—	
Physiology	10-11
Practical Physiology (twice weekly)	11-1
Practical Anatomy.	
Winter (*2nd Term*)—	
Physiology	10-11
Practical Physiology	11-1
Practical Anatomy and Demonstrations.	

	Hour of Meeting of Class.
Summer Term—	
Histology	8-10 or 11-1
Practical Materia Medica.	
Practical Anatomy and Demonstrations.	

(*Examination in Anatomy and Physiology.*)

Third Year.

Winter (*1st Term*)—	
Medicine	9-10
Pathology (Morbid Anatomy)	10-11
Clinical Medicine	11-1
Materia Medica	2-3
Pathology (including Elementary Bacteriology)	3-4
Practical Materia Medica	4-5
Winter (*2nd Term*)—	
Medicine	9-10
Pathology (Morbid Anatomy)	10-11
Clinical Medicine	12-1.30
Materia Medica	2-3
Pathology (including Elementary Bacteriology)	3-4
Practical Materia Medica	4-5
Summer Term—	
Pathology (Practical) (thrice weekly)	8-10
Pathology (Morbid Anatomy)	10-11
Clinical Surgery	12-2
Practical Materia Medica (if not previously attended).	
Vaccination	3-4

(*Examination in Pathology and Materia Medica.*)

Fourth Year.

Winter (*1st Term*)—			
Surgery			9-10
Midwifery (including Gynecology)			10-11
Sec. A. Diseases of Skin „ B. Diseases of Eye „ C. Diseases of Ear, etc.	11-12	Clinical Surgery	12-2
Dispensary Practice Infectious Diseases (once weekly)			Afternoon
Anæsthetics.			
Optional Classes.			
Winter (*2nd Term*)—			
Surgery			9-10
Midwifery (including Gynecology)			10-11
Sec. A. Diseases of Ear, etc. „ B. Diseases of Skin „ C. Diseases of Eye	11-12	Clinical Surgery	12-2
Mental Diseases (twice weekly)			3-4
Infectious Diseases (if not previously attended) Dispensary Practice Practical Midwifery			Afternoon
Summer Term—			
Operative Surgery			8-9.45
Public Health			10-11
Sec. A. Diseases of Children			11-1
„ B. Diseases of Ear, etc. „ C. Diseases of Skin	11-12	Clinical Medicine	12-1.30
Forensic Medicine			2-3
Infectious Diseases (if not previously attended)			Afternoon

(*Examination in Forensic Medicine and Public Health.*)

Fifth Year.

	Hour of Meeting of Class.
Winter (*1st Term*)—	
Tuberculosis	9-10
Clinical Gynecology	10-11
Sec. B. Diseases of Children	11-1
„ A. Diseases of Eye 11-12. Clinical Medicine	12-1.30
„ C. Clinical Medicine or Clinical Surgery.	
Dispensary Practice / Practical Midwifery	Afternoon
Optional Classes.	
Clinical Tuberculosis.	
Winter (*2nd Term*)—	
Clinical Gynecology	10-11
Sec. C. Diseases of Children	11-1
Secs. A. and B. Clinical Medicine or Clinical Surgery	12
Dispensary Practice / Practical Midwifery if not previously attended	Afternoon
Summer Term—	
Tuberculosis	9-10
Clinical Work in Hospital.	

(*Examination in Midwifery, including Gynecology, Surgery, and Medicine, and corresponding Clinical Examinations.*)

The candidate must attend Hospital for not less than three years; must attend both Clinical Medicine and Clinical Surgery for a period of at least nine months; twenty cases of Midwifery, or twelve cases and three months' attendance at a Maternity Hospital; and Post-Mortem Examinations for three months.

It is required that, before commencing the study of Practical Midwifery, every student shall have held the offices of Clinical Medical Clerk and Surgical Dresser, and have attended a Course of Lectures on Surgery and Midwifery.

Two of the five years of study must be spent at the University, and not less than eight of the compulsory subjects of study must be taken in the University.

The minimum expense of M.B. and Ch.B., including fees for Classes, Hospital, Matriculation and Examination, amounts to about £175.

Degree of M.D.

Each candidate for this degree who began medical study after 1st October 1892 must be of the age of twenty-four years or upwards, and must have obtained the degrees of M.B. and Ch.B. of the University. He must either have been engaged for two years in general practice, *or* for one year in the naval or military medical services, or in the medical wards of a hospital, or in scientific research. He must present a thesis written by himself on a medical subject, and pass an examination in Clinical Medicine. In this examination the candidate has to write a report and commentary on at least three cases, and has to show a practical knowledge in the application of the ophthalmoscope, laryngoscope, electrical apparatus, and sphygmograph, in the examination of the blood, and in the chemical and microscopical examination of the excreta.

The candidate who has graduated M.B. and C.M. under the old regulations may either proceed to the degree of M.D. under the old regulations (under which he is not required to pass an examination in Clinical Medicine, but must have passed examinations in Greek and in Logic or Moral Philosophy), or he may proceed to the degree as if he had graduated M.B., Ch.B. under the New Regulations.

Degree of Ch.M.

Each candidate must be not less than twenty-four years of age, must possess the degrees of M.B., Ch.B., must have attended the surgical wards of a hospital for one year, or have spent one year in scientific research or in the naval or military medical services, or two years in practice other than that restricted to medicine. He must submit a thesis on a surgical subject, and pass an examination on Clinical Surgery and its branches, Surgical Anatomy, and Operations on the Dead Body.

Fees for M.D. and Ch.M.

The fee for the M.D. degree under the old regulations is five guineas; for the M.D. or Ch.M., under the New Regulations, fifteen guineas. The candidate must have paid the matriculation fee for the year in which he presents himself for examination or graduation. At each reappearance for examination, under the New Regulations, the fee is five guineas.

Degrees in Public Health.

Two degrees are granted by the University of Edinburgh in the department of Sanitary Science, viz. B.Sc. and D.Sc.

Bachelor of Science.

Candidates must be graduates in Medicine of a University of the United Kingdom or of some other recognised University. In order to obtain the degree two examinations have to be passed.

First Examination.—Before entering for this examination the candidate must, after graduating in Medicine, have worked in a recognised Public Health Laboratory for eight months, of which five consecutive months must be passed in the Public Health Laboratory of the University of Edinburgh.

He must also have attended in a Scottish University a course of lectures on Physics and a course of lectures on Geology, extending over three months, and approved of by the University Court.

The subjects of examination are as follows:—

(1) *Laboratory* work—Practical, written and oral; examination of water, air, foods, beverages, condiments; sewage; soils; disinfectants; building materials; clothing; bacteriology.
(2) Physics. (3) Geology.

Second Examination.—This cannot be taken until eighteen months after graduating in medicine; nor sooner than six months after passing the First B.Sc. Examination. The candidate must have attended two separate courses on Public Health, either in the University of Edinburgh or in some other recognised University or School.

Each course must consist of forty lectures, and include Medicine in its relation to Public Health and Sanitary Engineering.

The candidate must likewise produce evidence (1) that for six months he has studied sanitary work under a Medical Officer of Health for a county or burgh of not less than 25,000 inhabitants; (2) that he has studied clinically for three months infectious diseases in a recognised institution; (3) that for three months he has been instructed by a recognised teacher in mensuration and drawing.

The subjects of examination are:—

(1) Sanitation; (2) Sanitary Law; (3) Vital Statistics; (4) Medicine in Relation to Public Health.

The candidate is examined orally, practically, and by a written paper. *Sanitation* includes making reports on dwellings, workshop, hospitals and sanitary schemes.

The University Court may modify the work and instruction prescribed rom time to time.

Doctor of Science.

A graduate after having held the degree of B.Sc. for five years may present himself for the D.Sc. He must present a thesis or a published work or memoirs, the result of his own research, and must pass an examination in Public Health, and in such of its special subjects as the Senatus may determine. The candidate must submit the subject in which he proposes to be examined for approval not less than two months before the examination.

Fees Payable.—First and second examinations, £3, 3s. each ; for D.Sc., £10, 10s.

INSTITUTIONS FOR CLINICAL INSTRUCTION IN EDINBURGH.

Royal Infirmary. 921 beds and 42 cots. Fees—perpetual ticket, £12 ; one year, £6, 6s. ; six months, £4, 4s. ; three months, £2, 2s. Clinical instruction is given daily in Medicine, Surgery, and all their special branches.

Royal Hospital for Sick Children. 120 beds. Hospital ticket, £1, 1s. Fee for Qualifying Course, £2, 2s.

City Hospital for Infectious Diseases. 600 beds. Fee, £1, 1s.

Royal Maternity and Simpson Memorial Hospital. 40 beds. The Maternity Residency affords accommodation for twelve students.

Royal Asylum, Morningside. 500 beds.

The fee for a qualifying course at each of these last two institutions is £2, 2s.

Royal Victoria Hospital for Consumption and Diseases of the Chest. 50 beds. Out-patient Department at Spittal Street.

Eye, Ear and Throat Infirmary. 6 beds ; 2700 Out-Patients yearly. Fee for three months, £1, 1s.

Royal, New Town, Medical Missionary (Cowgate), Western, Provident (Marshall Street), Eye, and Skin Dispensaries.

PROFESSORS AND LECTURERS IN EDINBURGH.

The Courses given by the Extramural Lecturers are recognised by the University and other examining boards as qualifying for graduation.

Botany— Professor Bayley Balfour, M.D., Royal Botanic Garden.

Zoology— Professor J. Cossar Ewart, M.D., University.
Malcolm Laurie, D.Sc., Surgeons' Hall.
Hugh Miller, F.Z.S., 29 George Square.

Biology— Malcolm Laurie, D.Sc., Surgeons' Hall.
C. R. Whittaker, F.R.C.S., New School.

Physics— Professor C. G. Barkla, D.Sc., University.
G. A. Carse, D.Sc., University.
Dawson Turner, M.D., Surgeons' Hall.
A. M'Kendrick, F.R.C.S., New School.

Chemistry— Professor Barger, University.
G. H. Gemmell, F.I.C., 4 Lindsay Place.
T. W. Drinkwater, Ph.D., Surgeons' Hall.

Anatomy— Professor A. Robinson, M.D., University.
J. Ryland Whitaker, M.B., Surgeons' Hall.

Applied Anatomy—
Sir H. J. Stiles, M.B., University.
J. Ryland Whitaker, M.B., Surgeons' Hall.

Physiology— Professor Sir E. Sharpey Schafer, LL.D., University.
Alexander Goodall, M.D., Surgeons' Hall.

Materia Medica and Therapeutics—
Professor A. R. Cushny, F.R.S., University.
William Craig, M.D., Surgeons' Hall.
John Orr, M.D., New School.

Pathology— Professor Lorrain Smith, M.D., University.
James Miller, M.D., Surgeons' Hall.

Surgery— Professor Alexis Thomson, *C.M.G.*, University.
A. A. Scot Skirving, *C.M.G.*, F.R.C.S., 27 Nicolson Square.
G. L. Chiene, F.R.C.S., New School.
Henry Wade, F.R.C.S., Surgeons' Hall.
J. W. Struthers, F.R.C.S., New School.
W. J. Stuart, F.R.C.S., 59 Forrest Road.
Lewis Beesly, F.R.C.S., Surgeons' Hall.

Clinical Surgery—
The Surgeons of the Royal Infirmary.
Professor Sir Harold J. Stiles.
Professor Alexis Thomson.
J. W. B. Hodsdon.
David Wallace.
Alexander Miles.
John W. Dowden.
A. A. Scot Skirving.
And Assistant Surgeons.

Practice of Medicine—
Professor G. Lovell Gulland, M.D., University.
Harry Rainy, M.D., 27 Nicolson Square.
R. A. Fleming, M.D., Surgeons' Hall.
A. Dingwall Fordyce, M.D., Dental Hospital.
W. T. Ritchie, M.D., Surgeons' Hall.

Clinical Medicine—
The Physicians of the Royal Infirmary.
Professor Sir Thomas R. Fraser.
Professor G. Lovell Gulland.
Professor F. D. Boyd, *C.B.*, *C.M.G.*
Sir R. W. Philip.
Dr. Graham Brown.
Dr. R. A. Fleming.
Dr. Harry Rainy.
Dr. Chalmers Watson.
Dr. Edwin Bramwell.
And Assistant Physicians.

Midwifery and Gynecology—
Professor Sir J. Halliday Croom, M.D., University.
D. Berry Hart, M.D., Surgeons' Hall.
J. W. Ballantyne, M.D., Surgeons' Hall.
A. H. F. Barbour, M.D., University and Royal Infirmary.
J. Haig Ferguson, M.D., New School.
N. T. Brewis, F.R.C.S., Royal Infirmary.
G. F. B. Simpson, M.D., New School.
John M'Gibbon, M.B., 59 Forrest Road.
H. S. Davidson, F.R.C.S., Nicolson Square.

Insanity— G. M. Robertson, M.D., University and Royal Asylum.
John Keay, M.D., Surgeons' Hall and Bangour Village Asylum.

Diseases of the Eye—
W. G. Sym, M.D., Royal Infirmary.
J. V. Paterson, M.B., Royal Infirmary.
A. H. H. Sinclair, M.D. (Ophthalmoscopy), 45 Lauriston Place.

Vaccination—W. G. Aitchison Robertson, M.D., D.Sc., Royal Dispensary.
W. D. D. Small, M.B., Provident Dispensary.

Diseases of Children—
J. S. Fowler, M.D.
J. W. Simpson, M.D.
A. D. Fordyce, M.D.

Diseases of the Skin—
Norman Walker, M.D., Royal Infirmary.
Frederick Gardiner, M.D., Surgeons' Hall.

Diseases of the Ear, Nose, and Throat—
A. Logan Turner, M.D., Royal Infirmary.
J. Malcolm Farquharson, M.B., Royal Infirmary.
J. S. Fraser, M.B., Surgeons' Hall.

Forensic Medicine—
Professor Harvey Littlejohn, F.R.C.S., University.
W. G. Aitchison Robertson, M.D., D.Sc., Surgeons' Hall.

Public Health—
Professor C. Hunter Stewart, M.B., University.
W. G. Aitchison Robertson, M.D., D.Sc., Surgeons' Hall.
Wm. Robertson, M.D., Surgeons' Hall.

Fevers— Alexander James, M.D., City Hospital.
C. B. Ker, M.D., City Hospital.

Bacteriology—
Professor James Ritchie, M.D., University.
J. Taylor Grant, M.D., 4 Lindsay Place.
James Miller, M.D., Surgeons' Hall.

Diseases of Tropical Climates—
Lieut.-Colonel D. G. Marshall, I.M.S., University and Surgeons' Hall.

Practical Medicine and Physical Diagnosis—
Alexander Goodall, M.D., Surgeons' Hall.
R. A. Fleming, M.D., Nicolson Square.
J. D. Comrie, M.D., 59 Forrest Road.

Neurology— J. J. Graham Brown, M.D., University.

Physical Methods in the Treatment of Disease—
Harry Rainy, M.D., University.

Tuberculosis—
Professor Sir R. W. Philip, M.D., University.

Medical Electricity and Röntgen Rays—
Dawson Turner, M.D., Surgeons' Hall.

Practical Anæsthetics—
J. Stuart Ross, M.B., University.

History of Medicine—
J. D. Comrie, M.D., University.

UNIVERSITY OF GLASGOW.

Degree of M.B. and Ch.B.

During the last decade there has been a continual expansion of the facilities provided for both scientific and practical training. During the present year three new Chairs have been provided in Organic Chemistry, in Physiological Chemistry, and in Bacteriology, and four new University Lectureships have been instituted—two in Tuberculosis, one in the Surgical Diseases of Children, and the fourth in the Medical Diseases of Children.

The special feature of the school upon the practical side is the classification of the staff of Professors and Lecturers in the subjects of the two final years of study. Systematic as well as clinical classes are conducted not only at the Western Infirmary and adjoining University Buildings, but also at the Royal Infirmary. Students accordingly have the option of taking these subjects either at the Western or the Royal Infirmary. In this way the advantage is afforded of a very wide clinical field along with systematic instruction under University Professors, and the great disadvantage of attending classes at Gilmorehill and going to the Royal Infirmary, at a considerable distance, for clinical work is thus done away with. The same arrangement has been made in the case of Pathology. There are large and fully equipped Pathological Institutes, with class-room accommodation, at both Infirmaries, each under a University Professor who is *ex officio* Pathologist to the Infirmary, and has control of all the pathological material for purposes of instruction and investigation.

There is a Laboratory for Clinical Pathology at the Western Infirmary, the Director of which is also a University Lecturer, and gives instruction to University students in the scientific methods of clinical diagnosis.

Under the New Ordinance of the University Court, which came into operation on 1st October 1911, the regulations for these Degrees (except in regard to the Preliminary Examination) have been considerably altered, the chief modifications being as follows :—1. A rearrangement of the subjects of the four Professional Examinations. 2. The rendering compulsory of some courses which hitherto have been optional. 3. The imposition of restrictions as to the period at which certain subjects of the curriculum can be taken.

The academical year is now divided into three terms of about ten teaching weeks each, and the following list gives the subjects of the several Professional Examinations, with the period of study required :—

First Examination.

Chemistry (including Organic Chemistry), 2 terms ; with Practical Chemistry 1 term.
Physics (with practical work), 1 term.
Botany (with practical work), 1 term.
Zoology (with practical work), 1 term.

Second Examination.

Anatomy and Practical Anatomy, 5 terms.
Physiology and Practical Physiology, 3 terms.

Third Examination.

Materia Medica and Therapeutics, 2 terms.
Pathology and Practical Pathology, 3 terms.

Fourth Examination.

Medical Jurisprudence and Public Health, 2 terms.
Surgery, 2 terms.
Practice of Medicine, 2 terms.
Midwifery and Diseases Peculiar to Women and Infants, 2 terms.

The candidate must have attended the Medical and Surgical practice of a general hospital for three years, and courses of Clinical Surgery and Clinical Medicine of nine months in each case. He must also have received instruction, under conditions laid down, in the following subjects :—

Mental Diseases.
Practical Pharmacy.
Out-Patient Practice.
Clinical Clerking in Medicine.
Clinical Clerking or Dressing in Surgery.
Post-Mortem Examinations.
Infectious Diseases.
Gynecology.
Diseases of Children.
Ophthalmology.
Diseases of the Ear and Throat.
Dermatology.
Practical Midwifery with the Conduct of Cases of Labour.
Vaccination.
Administration of Anæsthetics.
Operative Surgery.

The following courses cannot be taken till after the end of the terms of the curriculum indicated in each case :—

Physiology and Practical Physiology—third term, and not (except Practical Histology) till at least three of the subjects of the First Examination have been passed.

Materia Medica and Therapeutics, and Pathology and Practical Pathology—sixth term.

Medical Jurisprudence and Public Health—after completion of classes for the Third Professional Examination.

Midwifery, etc., Surgery and Medicine—ninth term, with the exception that Surgery may be attended after the sixth term, provided that the candidate has passed the Second Professional Examination.

Hospital Practice, Clinical Medicine, Clinical Surgery—sixth term.

The curriculum extends over five years, two of which must be spent in the University of Glasgow. The remaining three years may be spent elsewhere, as indicated in the Ordinance and under the conditions thereby imposed.

Except in the case of Medicine, Surgery, and Midwifery, the Senate may accept the Professional Examinations of other Scottish Universities.

There are a number of other administrative regulations which need not here be specified in detail.

The examination fees are £23, 2s. in all, with an additional fee of £1, 1s. for every re-entry. The cost of the curriculum amounts roughly to £145, spread over the five years of the course, and at present the class fees are charged at so much a class. There is, however, a movement on foot to introduce a "composition" or "inclusive" fee per session, but the total will work out at practically the above figure.

Clinical Facilities.

The following general hospitals, all of which are equipped in a modern fashion, are available for instruction of University students, viz. the Western Infirmary close to the University, the Royal Infirmary, to which the new

Medical Chairs are attached, each of these having at present about 600 beds, and the Victoria Infirmary, with 260 beds, on the south side of the city.

The Eye Infirmaries at 174 Berkeley Street and 80 Charlotte Street (between them 100 beds), and the Ophthalmic Institution at 126 West Regent Street (35 beds), furnish ample opportunities for instruction in the important branch with which they deal; Insanity is equally well provided for at Gartnavel (460 beds), at Hawkhead (700 beds), at Gartloch (806 beds), and at Woodilee (1160 beds), while the City Fever Hospitals at Ruchill (540 beds) and Belvidere (680 beds) are available for the study of Zymotic Diseases. The Ear, the Throat and Nose, and the Skin are dealt with in the Western and Royal Infirmaries.

The Maternity Hospital, with every modern convenience and equipment, is situated in Rottenrow, and has accommodation for 104 patients. A new hospital for Sick Children, of greatly increased dimensions, in freer air, has been erected at Yorkhill within a short distance of the University. The beds number 200.

The Ordinance is applicable alike to men and women students, and much of the instruction is given in "mixed" classes by the Professors. There are, however, exceptions to this, some classes for women alone being held in a separate building (Queen Margaret College), and some for both sexes (in the main buildings at Gilmorehill) at different hours. Women are now admitted both to the Western and Royal Infirmaries on the same terms as men.

PROFESSORS.

Zoology— Professor Graham Kerr, M.A., F.R.S.

Chemistry— Professor G. G. Henderson, D.Sc., F.R.S.

Organic Chemistry—
Professor T. S. Patterson, D.Sc., Ph.D.

Practical Physics—
Professor Gray, M.A., LL.D., F.R.S.

Botany— Professor Bower, Sc.D., F.R.S.

Anatomy— Professor Bryce, M.A., M.D.

Physiology— Professor Noël Paton, B.Sc., M.D., F.R.S.

Physiological Chemistry—
Professor E. P. Cathcart, M.D., D.Sc.

Materia Medica and Therapeutics—
Professor Stockman, M.D.

Pathology— Professor Muir, M.A., M.D., F.R.S.

Medical Jurisprudence—
Professor Glaister, M.D., D.P.H.(Camb.).

Surgery and Clinical Surgery—
Professor Sir William Macewen, M.D., LL.D., D.Sc., F.R.S.

Midwifery— Professor Murdoch Cameron, M.D.

Practice of Medicine and Clinical Medicine—
Professor T. Kirkpatrick Monro, M.A., M.D.

Public Health—
Professor Glaister, M.D., D.P.H.(Camb.).

Pathology— Professor John H. Teacher, M.A., M.D.

Bacteriology—
Professor Carl H. Browning, M.D.

Medicine and Clinical Medicine—
Professor Walter K. Hunter, D.Sc., M.D.

Surgery and Clinical Surgery—
Professor Robert Kennedy, M.A., D.Sc., M.D.
Midwifery— Professor John M. Munro Kerr, M.D.

Lecturers.

Psychological Physiology—
Henry J. Watt, M.A., Ph.D., D.Phil.
Ear— A. A. Gray, M.D., and J. Kerr Love, M.D.
Throat and Nose—
James Walker Downie, M.B., and J. Macintyre, M.B.
Skin— John Wyllie Nicol, M.B., and G. M'Intyre, M.B.
Clinical Pathology—(Vacant).
Bacteriology—
G. Haswell Wilson, M.B., Ch.B.
Physics— James G. Gray, D.Sc.
Insanity— Landel R. Oswald, M.B., and J. H. Macdonald, M.B.

Dean.

Professor T. H. Bryce, M.A., M.D.

Degree of M.D.

This degree is open to holders of the M.B., Ch.B. diploma, after a period of one or two years, according to circumstances, has elapsed since the date of the latter. The requirements are (*a*) an Examination in Clinical Medicine, or in some approved department of Medical Science or Practice ; (*b*) a Thesis on any branch of knowledge comprised in the examinations for M.B., Ch.B., excepting a subject which is exclusively surgical ; and (*c*) a fee of £15, 15s., with an extra charge of £5, 5s. for each re-entry.

Degree of Ch.M.

This may be obtained on practically the same terms as the M.D. degree, the only differences being (1) that the examination is on Surgical Anatomy, operations upon the dead body, on Clinical Surgery or an approved special department of Surgery, and (2) that the Thesis must not be on a subject which is exclusively medical.

Degree of B.Sc. in Public Health.

Candidates must be graduates in Medicine of a University in the United Kingdom or of some other University recognised for the purpose by the Glasgow University Court, and they must thereafter have received practical instruction, including instruction in Chemistry, Bacteriology, and the Pathology of the Diseases of Animals transmissible to man, for at least twenty hours per week during a minimum period of eight months, five consecutive months of which must be in the Public Health Laboratory of the University of Glasgow. Either before or after graduation in Medicine they must also have attended, in the University of Glasgow or elsewhere, courses of Physics and Geology, and after graduation two separate courses in Public Health (Medicine and Engineering), as well as practically studying sanitary work for six months under a Medical Officer of Health in the United Kingdom, or a Sanitary Staff Officer of Health of the Royal Army Medical Corps, besides attending three months' practice of a Hospital for Infectious Diseases, where methods of

administration can be studied, and three months in Mensuration and Drawing. The examinations are, *First*, Public Health, Laboratory Work, Physics, and Geology ; *Second*, Sanitation, Sanitary Law, Vital Statistics, and Medicine in its bearings on Public Health. The examination fee is £6, 6s.

Degree of D.Sc. in Public Health.

Five years after obtaining the B.Sc. degree, graduates may proceed to the higher Degree of D.Sc., the requirements being (*a*) a Thesis or a published memoir or work to be approved by the Senate ; and (*b*) an examination in Public Health and in such of its special departments as the Senate and University Court may determine. The fee for this degree is £10, 10s.

QUEEN MARGARET COLLEGE FOR WOMEN.

(Women's Department of the University of Glasgow.)

This is an integral part of the University of Glasgow. The courses, regulations, and fees for the medical course are the same as for men. The instruction is given by University Professors and Lecturers appointed by the University Court, partly in mixed and partly in separate classes. The College provides a separate building, with class-rooms, laboratories, library, and other teaching appliances. The administrative offices of the Women's Department are at Queen Margaret College. The women have all the rights and privileges of University students. Clinical work is amply provided for in the Royal Infirmary and its Dispensaries, the Western Infirmary, the Royal Hospital for Sick Children, the Glasgow Maternity Hospital, the Royal Asylum of Gartnavel, Belvidere and Ruchill Fever Hospitals, etc.

There are one or two small halls of residence near the College, and a list of lodgings can be obtained from the College Office.

All necessary information can be had from the Secretary to the Mistress, Queen Margaret College, Glasgow.

ST. MUNGO'S COLLEGE.

St. Mungo's College is contiguous to the Royal Infirmary, which is the largest hospital in Glasgow, and is situated in Cathedral Square, Castle Street. The classes are open to women students. There is car communication with every part of the city.

The Infirmary has, including the Ophthalmic Department, over 835 beds, the average number occupied in 1916 being 767. There are special beds and wards for Diseases of Women, of the Throat, Nose and Ear, Skin, Venereal Diseases, Burns, and Septic Cases.

At the Outdoor Department the attendances in 1916 numbered over 137,000. In addition to the large Medical and Surgical Departments, there are Departments for Special Diseases—namely, Diseases of Women, of the Throat and Nose, of the Ear, of the Eye, of the Skin, and of the Teeth. A fully-equipped Electrical Pavilion was opened a few years ago, and year by year the latest and most approved apparatus for diagnosis and treatment has been added. Wards are set apart for the teaching of women students.

Appointments.—Five House Physicians and twelve House Surgeons, having a legal qualification in Medicine and Surgery, who board in the Hospital free of charge, are appointed every six months. Clerks and Dressers are appointed by the Physicians and Surgeons. As a large number of cases of acute diseases and accidents of a varied character are received, these appointments are very valuable and desirable.

Fees.—The fees for (*a*) hospital attendance, including attendance at the

Outdoor Department, at the Pathological Department, Post-Mortem Examinations, and the use of the Museum, and (*b*) Clinical Lectures, are as follows :—

(*a*) For Infirmary Attendance, Dispensary, etc.—

A. For Perpetual Ticket £7 0 0

B. For Season Tickets—

Six months 2 2 0

Three months 1 1 0

Separate payments by a student for Season Tickets amounting in all to £7, 7s. shall, however, entitle a student to obtain from the superintendent a Perpetual Ticket in exchange therefor.

(*b*) For Clinical Instruction—

Two terms or six months £3 10 0

One term or three months 1 15 0

(*c*) Students who have paid to any other hospital in the United Kingdom or elsewhere the fees necessary to obtain a Perpetual Ticket for such hospital shall be admitted as students of the Royal Infirmary on payment of a hospital entrance fee of £1, 1s. for attendance for six months, and 10s. 6d. for attendance for three months; and where a class for clinical instruction is taken, he shall pay in addition the fees for such instruction as above stated.

THE ANDERSON COLLEGE OF MEDICINE,

DUMBARTON ROAD, PARTICK, GLASGOW.

The old Institution known as "Anderson's University" was founded by the will of John Anderson, M.A., F.R.S., in 1795, and the medical school connected therewith dates back to the year 1799.

In 1877 the name of the Institution was altered from "Anderson's University" to "Anderson's College." In 1887 the medical school of Anderson's College became a distinct Institution known as "Anderson's College Medical School."

The new buildings are situated in Dumbarton Road, adjoining the Western Infirmary and the University. They are constructed on the best modern principles, and are provided with all the appliances requisite for the conduct and management of a fully equipped medical school.

Classes are conducted in all the subjects of the five years' curriculum :—

Anatomy—Vacant.
Physics—Professor Peter Bennett.
Chemistry—Professor J. Robertson Watson, M.A.
Botany—Professor B. G. Cormack, M.A., B.Sc.
Zoology—Professor W. Ferguson Mackenzie, M.B.
Physiology—Professor Hugh Morton, M.D.
Materia Medica—Professor J. P. Duncan, M.B., B.Sc.
Medical Jurisprudence—Professor Carstairs Douglas, D.Sc., M.D., F.R.S.E.
Midwifery—Professor W. D. Macfarlane, M.B., C.M.
Surgery—Professor Archibald Young, B.Sc., M.B.
Practice of Medicine—Professor John Cowan, B.A., D.Sc., M.D.
Ophthalmic Medicine and Surgery—Professor A. J. Ballantyne, M.D.
Aural Surgery—Professor James Galbraith Connal, M.D.
Diseases of Throat and Nose—Professor John Macintyre, M.B., F.R.S.E.
Mental Diseases—Ivy Mackenzie, M.A., B.Sc., M.D.
Public Health Laboratory—Professor Carstairs Douglas, D.Sc., M.D., F.R.S.E
Pathology—At the Western or Royal Infirmary.
Diseases of the Skin—Professor J. Goodwin Tomkinson, M.D.
Dental Anatomy and Physiology—W. Wallace, M.A., M.D., L.D.S.
Dental Surgery and Pathology—John Watt, L.R.C.P., L.D.S.
Dental Metallurgy—Chas. Read, L.R.C.P., L.D.S.
Dental Bacteriology—Professor Carstairs Douglas, M.D., D.Sc., F.R.S.E

Degrees and Diplomas.—Certificates of attendance on the classes at The Anderson College of Medicine are received by the Universities of London and Durham, by the Royal University of Ireland, and by all the Royal Colleges and Licensing Boards in the United Kingdom. They are also recognised by the Universities of Glasgow and Edinburgh under certain conditions which are stated in the Calendar of this school. The Public Health Laboratory Course is recognised as qualifying for the Diploma granted by the Universities of Oxford, London, and Cambridge, the Scottish Conjoint Board, and the Royal Irish Colleges.

Candidates for the Licence in Dental Surgery can obtain at this School the full medical and dental curriculum which is required. The clinical work special to dentistry is conducted at the Glasgow Dental School, 15 Dalhousie Street.

Malcolm Kerr Bursary in Anatomy. Value about £10. Open to students of the junior anatomy class.

The Carnegie Trust will pay the fees of students at Anderson's, on conditions regarding which particulars may be obtained from Sir W. S. M'Cormick, LL.D., Carnegie Trust Offices, Edinburgh.

Class Fees.—For each course of lectures (anatomy, ophthalmic medicine and surgery, aural surgery, diseases of throat and nose, mental diseases, diseases of the skin, and dental classes excepted): first session, £2, 2s.; second session (in the College), £1, 1s.; afterwards free. Lectures on ophthalmic medicine and surgery, aural surgery, diseases of the throat and nose, mental diseases and diseases of the skin, each course, £1, 1s. For practical classes (except anatomy), viz. chemistry, botany, zoology, physiology, pharmacy, operative surgery: first session, £2, 2s.; second session, £2, 2s.

Reduced joint fees in zoology and in botany, for lectures and practical class when taken in same summer session, £3, 3s.; for either course separately, £2, 2s.

Anatomy.—Winter—first session, lectures and practical anatomy, £5, 5s.; practical anatomy alone, £2, 2s.; second session, lectures and practical anatomy, £4, 4s.; practical anatomy, £2, 2s.; for summer fees, see Calendar.

Dental Classes.—£3, 3s. each.

ABERDEEN UNIVERSITY.

The course of study for the degree of M.B., Ch.B. extends over five years, of which two at least must be spent in the University of Aberdeen.

The curriculum is the same as in the other Scottish Universities as far as relates to attendance on University classes, to clinical study at a General Hospital, to attendance on courses of Clinical Surgery, Clinical Medicine, Mental Diseases, and Practical Pharmacy, Operative Surgery, Anæsthetics, to instruction in Vaccination, to attendance on Cases of Labour, and to the practice of a Dispensary.

The candidate must also, before admission to the final examination, produce the following certificates:—

1. That he has been present at not fewer than twenty-five post-mortem examinations, some of which he must have personally taken part in performing.
2. That he has attended a course of instruction in Infectious Diseases consisting of not fewer than ten meetings, in a Hospital for the treatment of such diseases containing at least a hundred beds.
3. That he has attended in a Hospital a course of instruction in Gynecology consisting of not fewer than twenty meetings.
4. That he has attended in a special hospital a course of instruction in the Diseases of Children, consisting of not fewer than twenty meetings.
5. That he has attended in the Ophthalmological Department of a Hospital or Dispensary a course of instruction in Ophthalmology, consisting of not fewer than thirty meetings extending over one term.
6. That he has attended in a Public Hospital or Dispensary a course of

instruction in Diseases of the Ear, Nose, and Throat, consisting of not fewer than twenty meetings.

7. That he has attended in a Public Hospital or Dispensary a course of instruction in Dermatology, consisting of not fewer than twenty meetings.

Certificates for these various classes and courses must attest not only regular attendance, but also due performance of the work.

There is no prescribed order of study, but a scheme, representing the minimum curriculum, has been drawn up for the guidance of students, and is printed in the Calendar.

THE FOLLOWING ARE THE CLASSES IN THE MEDICAL FACULTY:—

WINTER SESSION.

Zoology—Professor John Arthur Thomson, M.A., LL.D.
Chemistry (Syst. and Pract.)—Professor Frederick Soddy, M.A., F.R.S.
Anatomy—Professor Reid, M.D., F.R.C.S.
Practical Anatomy—Professor Reid.
Physiology (Syst. and Pract.)—Professor MacWilliam, M.D., F.R.S.
Materia Medica—Professor Cash, M.D., LL.D., F.R.S.
Pathology (Syst. and Pract.)—Professor Theodore Shennan, M.D., F.R.C.S.E.
Public Health—Mr. John Parlane Kinloch, M.D., *Lecturer.*
Surgery—Professor John Marnoch, C.V.O., M.A., M.B., C.M.
Medicine—Professor Mackintosh, M.A., M.D.
Midwifery and Diseases of Women and Children—Professor R. G. M'Kerron, M.A., M.D.

SUMMER SESSION.

Botany—Professor Trail, M.A., M.D., F.R.S.
Practical Botany—Professor Trail.
Zoology—Professor Thomson.
Practical Zoology—Professor Thomson.
Physics—Professor Niven, M.A., D.Sc., F.R.S.
Practical Anatomy—Professor Reid.
Practical Materia Medica and Pharmacy—Professor Cash.
Physiology (Syst. and Pract.)—Professor MacWilliam.
Forensic Medicine—Professor Hay, M.D., LL.D.
Practical Hygiene and Forensic Medicine—Professor Hay.
Pathology (Syst. and Pract.)—Professor Shennan.
Practical Midwifery and Gynecology and Clinical Diseases of Children—Professor M'Kerron.

There are Assistants to all the Professors in the Medical Faculty, and also Lecturers in special departments—Chemistry (2), Embryology, Parasitology, Bio-Chemistry, etc.

Clinical Medicine and Clinical Surgery are taught by the Physicians and Surgeons of the Royal Infirmary.

The following are recognised as Lecturers:—

Lecturer on	Mental Diseases . .	Wm. Reid, M.D.
„	Ophthalmology . .	C. H. Usher, M.B., B.S., F.R.C.S. A. Rudolph Galloway, M.A., M.B., C.M.
„	Vaccination . .	T. Fraser, M.A., M.B., Ch.B.
„	Skin Diseases . .	J. F. Christie, M.A., M.B., C.M.
„	Diseases of Ear, Throat, and Nose . .	J. Mackenzie Booth, M.D., C.M. H. Peterkin, M.B.
„	Medical Electricity .	J. R. Levack, M.B., C.M.
„	Anæsthetics . .	Alex. Ogston, M.B., C.M. D. W. Geddie, M.B., C.M.

All the University Classes are held at Marischal College.

Tutorial Classes are held in connection with most of the Systematic

Courses, and practical instruction is given in the fully equipped Laboratories connected with the several departments.

Graduates or others desirous of engaging in special study or research may be allowed by the Senatus to work in any of the Laboratories on payment of the usual matriculation fee.

General clinical instruction is obtained in the following Medical Institutions :—

The Royal Infirmary of Aberdeen.

This General Hospital, situated about seven minutes' walk from Marischal College, has been recently constructed on the most modern principles, and is fully equipped with all the requirements for medical work and teaching. It accommodates upwards of 270 patients : the number of patients admitted during the year 1914 was 3242, and the number of out-patients treated during the same period was 15,214.

Six resident medical officers are appointed annually, three in May and three in September, to hold office for twelve months. Salary, £26, 5s. with board.

Fees.—Perpetual fee to hospital practice, £10, or first year, £5, 10s., second year, £5, afterwards free ; clerkship in medicine, £1, 1s. ; dressership in surgery, £1, 1s. ; pathological demonstrations, £2, 2s. (Special courses of lectures are charged for.)

The Royal Hospital for Sick Children.

Is situated about five minutes' walk from Marischal College, and accommodates over 80 patients. The number of patients admitted in 1914 was 888, and the number of out-patients treated was 2057. Each student must act as clerk for six weeks in the medical and surgical wards respectively.

There are two resident medical officers, senior and junior, who hold office for six months. Salary at the rate of £25 per annum in the case of the senior resident, and £20 per annum in the case of the junior resident.

Fee for hospital practice, £2, 2s. first year.

Note.—The above Hospital is temporarily removed to Kepplestone House.

The Royal Asylum.

Is about fifteen minutes' walk from Marischal College. It accommodates over 950 patients, and has been recently fitted up with a fully equipped hospital and a laboratory.

The senior physician is recognised by the University as lecturer on mental diseases, and delivers a qualifying course of lectures.

The City (Fever) Hospital.

Is about ten minutes' walk from Marischal College, and accommodates 250 patients.

Senior students are admitted for instruction in fevers twice a week under the visiting physician (who is the Medical Officer of Health for the City) and his assistant. Fee, £1, 1s.

General Dispensary and Vaccine Institution.

This is about five minutes' walk from Marischal College.

The total number of cases treated during 1914 was 6088, and the number of patients treated at their own homes 1085.

Fees.—General practice, £3, 3s. ; vaccination certificate and instruction, £1, 1s.

Aberdeen Maternity Hospital.

This Institution is situated at the top of Castle Terrace, less than ten minutes' walk from Marischal College. Contains 18 beds. The number of

patients treated in the hospital during 1914 was 203 and at their own homes 96—in all, 299. Fee, £3, 3s.

Ophthalmic Institution.

This Institution is situated about three minutes' walk from Marischal College. The surgeon in charge is recognised by the University as a lecturer on ophthalmology.

During 1914, 33 in-patients and 3080 out-patients were treated.

PROFESSIONAL EXAMINATIONS.

There are four examinations: the subjects and regulations of these are common to the Universities of Aberdeen and Glasgow.

Degree of M.D.

The regulations with regard to the age and other qualifications of the candidate are similar to those in the other Scottish Universities. He must submit a thesis written by himself upon any medical subject, and pass an examination in Clinical Medicine or in some Special Department of Medical Science or Practice.

Degree of Ch.M.

Each candidate must be not less than twenty-four years of age, and must hold the degree of M.B., Ch.B. of the University. He must produce a certificate of having been engaged for at least one year in attendance in the surgical wards of a hospital, or in scientific research, or in the naval and military services, or for two years in practice other than practice restricted to medicine. He must present a thesis on a surgical subject and pass an examination on Clinical Surgery, Surgical Anatomy, and Operations on the Dead Body.

Diploma in Public Health (D.P.H.).

The diploma is conferred, after special instruction and examination, on anyone who has been at least twelve months a graduate in medicine of a University in the United Kingdom; if not a graduate of Aberdeen University, the candidate must attend a course of instruction in this University in one or more subjects embraced in the examination for the diploma.

Each candidate must have attended a course of instruction in Public Health.

The qualifying post-graduate instruction embraces—

(*a*) Regular attendance, for three months, at a hospital for infectious diseases, at which opportunities are afforded for the study of methods of administration.

(*b*) Daily association for a period of six months (of which at least three months must be distinct from the period of laboratory instruction) in the duty, routine and special, of Public Health Administration, under the supervision of a recognised Medical Officer of Health.

(*c*) Practical instruction, for at least six months, in laboratory work, which includes examination of water, air, soils and food, and the study of bacteriology, disinfection, ventilation, water supply and sewerage, and the framing of reports of analysis. The laboratory attendance must extend over at least fifteen hours a week.

The qualifying courses of laboratory instruction in Aberdeen University are given in the Public Health Laboratory (fee, £6, 6s.), and the Bacteriological Laboratory (fee, £4, 4s.).

Instruction in Public Health Administration is given by Professor Hay, Medical Officer of Health of the City of Aberdeen (fee, £6).

Instruction is given in the Drawing and Interpretation of Plans (fee £1, 1s.).

A short course of lectures is given on Statistical Methods and their application to Public Health.

The diploma is conferred after an examination in March and July of each year.

The examination is written, oral and practical, and is divided into two parts.

Part I. embraces the following subjects in their application to Public Health :—

(*a*) Physics, Engineering, and Meteorology.

(*b*) Chemistry, Microscopy, and Bacteriology.

Part II. embraces—

(*a*) General Hygiene.

(*b*) Sanitary Law and Vital Statistics.

Part I. may be taken alone, or both parts together.

The written examinations occupy two days, and the oral and laboratory and outdoor examinations three to four days.

Candidates must send in their names and pay the fees a fortnight before the examination. Examination fee is five guineas. Re-examination fee one guinea.

FEES.

Arrangements have been made, in conjunction with the other Scottish Universities, for the institution of an inclusive fee for the courses of instruction leading to the M.B. and Ch.B. degrees. The inclusive fee for instruction within the walls of the University is ninety guineas, payable in five annual instalments.

The cost of matriculation, class and hospital fees for the whole curriculum, including the fees for the degrees, is usually about £160.

UNIVERSITY OF ST. ANDREWS.

The degrees conferred are Bachelor of Medicine and Bachelor of Surgery (M.B., Ch.B.), Doctor of Medicine (M.D.), and Master of Surgery (Ch.M.). The inclusive fee for the University instruction for M.B., Ch.B. is ninety guineas; and the inclusive fee for the clinical courses is forty guineas. These fees may be paid by annual instalments. For M.D. or Ch.M. the fee payable is fifteen guineas.

Two constituent colleges of the University provide medical teaching—the United College at St. Andrews and University College in Dundee. At St. Andrews classes for two years may be taken, and the student may pass the first and second professional examinations at St. Andrews. There are excellent opportunities for combining degrees in Arts and Science with those of Medicine. Inclusive fees have been arranged for students who wish to take advantage of these opportunities. There are many bursaries offered to students who desire to graduate in Medicine, and it should be added that the cost of rooms and of living in St. Andrews is considerably less than in the larger University cities. For women, both at St. Andrews and in Dundee, there are excellent residential halls provided, which are governed by the University authorities. The medical school is now carried on in buildings specially built for the purpose.

The Conjoint School of Medicine, Dundee, supplies a complete course of medical study, and the student from the United College, St. Andrews, completes his curriculum there. Large new buildings with well-equipped laboratories have been provided. Both in the Medical School and the wards of the Dundee Royal Infirmary the students have unrivalled opportunities for gaining a practical knowledge of medical science and of medical work, for they have individual attention and supervision which the larger schools cannot give.

The Dundee Royal Infirmary contains 400 beds, and includes special wards for obstetrics, gynecology, children's diseases, ophthalmology, dermatology, otology, and electrical therapeutics. New out-patient departments are now

in use. There is a large out-door maternity department. Hospital Fees—Surgical and Medical, £3, 3s. yearly ; Perpetual Ticket, £10, or in instalments, £10, 10s. ; Obstetric Cases, £2, 2s. ; Obstetric Clinic, £1, 1s.

Westgreen Asylum at Liff provides abundant material for instruction in mental diseases, and the City Fever Hospital in fevers. The Dundee Eye Institution furnishes cases for instruction in ophthalmology.

The Diploma of Public Health (D.P.H.) may be taken at the Conjoint School of Medicine, Dundee.

A Diploma in Dental Surgery (L.D.S.) is also granted by the University. Instruction in the University, Royal Infirmary, and Dundee Dental Hospital.

All classes in the University are open to men and women alike.

UNITED COLLEGE, ST. ANDREWS.

Professors and Lecturers.

Physics— Professor Butler, M.A.
Chemistry— Professor Irvine, Ph.D., D.Sc.
Zoology— Professor Thomson, M.A., D.Litt., F.R.S., C.B.
Botany— R. A. Robertson, M.A., B.Sc.
Physiology—Professor Herring, M.D.
Anatomy— Professor D. Waterston, M.D., F.R.C.S.

UNIVERSITY COLLEGE, DUNDEE.

Professors and Lecturers.

Physics— Professor Peddie, D.Sc.
Chemistry— Professor Mackenzie, D.Sc., F.R.S.
Botany— Professor Geddes, F.R.S.E.
Physiology—Professor Waymouth Reid, M.B., Sc.D., F.R.S.
Anatomy— Principal Mackay, M.D., LL.D.
Lieut.-Col. Lamont, M.B., I.M.S. (retired).
Surgery— Professor L. Turton Price, Ch.B., F.R.C.S.
Surgery, Clinical—
D. M. Greig, C.M., F.R.C.S.
Medicine— Professor Stalker, M.D.
Medicine, Clinical—
Professor Stalker, M.D. ; J. Mackie Whyte, M.D.
Materia Medica—
Professor F. Charteris, M.D.
Pathology— Professor Sutherland, M.B.
Midwifery and Gynecology—
Professor Kynoch, M.B., F.R.C.P., F.R.C.S.
Midwifery and Gynecology, Clinical—
Professor Kynoch, M.B., F.R.C.S. F.R.C.P.
R. C. Buist, M.D.
Forensic Medicine and Public Health—
W. L. Buyers, M.D., D.P.H.
Ophthalmology—
Angus MacGillivray, M.D., D.Sc.
Diseases of Ear, Nose, and Throat—
R. P. Mathers, M.D.
Diseases of Children—
D. M. Greig, C.M., F.R.C.S.
J. S. Y. Rogers, M.B.
Diseases of Skin—
W. E. Foggie, M.D.

Mental Diseases—
W. Tuach Mackenzie, M.D.
Vaccination—
R. C. Buist, M.D.
Fevers— W. L. Burgess, M.D., D.P.H.
Clinical Pathology—
F. M. Milne, M.B., D.P.H.
Clinical Medical Tutor—
Charles Kerr, M.B.
Clinical Surgical Tutor—
W. L. Robertson, Ch.B., F.R.C.S.
Anæsthetics—
A. Mills, M.D.
Bacteriology—
W. J. Tulloch, M.D.
Dean of the Faculty of Medicine—
Professor Kynoch.

QUALIFICATIONS GIVEN BY THE SCOTTISH COLLEGES.

The Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Edinburgh, and the Royal Faculty of Physicians and Surgeons of Glasgow, conjointly confer the Triple Qualification (L.R.C.P.E., L.R.C.S.E., L.R.F.P.S.G.). Female candidates are admitted to the examinations for this qualification.

Preliminary Examination. — This examination must be passed before the student commences professional study. It may be passed before any of the Boards recognised by the General Medical Council, and enumerated in the Regulations of the Colleges. The Educational Institute of Scotland conducts a qualifying Preliminary examination for medical students, in Edinburgh and Glasgow, on behalf of the Colleges. This examination embraces English, Latin, Mathematics, and either Greek, French, German, Italian, or other modern language. All the subjects may be passed at one or not more than two times. Calendar, containing examination papers, can be had from Mr. Hugh Cameron, M.A., 34 North Bridge Street, Edinburgh. Price 1s.

Professional Education.—The curriculum must extend over five years. Graduates in Arts or Science of any recognised University who have spent a year in the study of Physics, Chemistry, and Biology, and have passed an examination in these subjects for the degrees in question, are exempted from the first year of study. The fifth year of study should be devoted to clinical work in one or more recognised Hospitals or Dispensaries, and to the study of special diseases. For information regarding the payment of class fees by the Carnegie Trust, *vide* p. i.

Order of Study which is Recommended.

First Summer— Physics and Elementary Biology.
First Winter— Five months' course in Chemistry and Anatomy; three months' course in Practical Chemistry; Practical Anatomy.
Second Summer— Practical Anatomy and Lectures; Practical Physiology.
Second Winter— Practical Anatomy; Physiology—Five months' course.
Third Summer— Three months' course in Practical Pathology, Materia Medica, and Practical Materia Medica; Surgical Hospital Practice.
Third Winter— Six months' course in Surgery and Clinical Surgery; Attendance at Surgical Wards; Anæsthetics; Pathology.
Fourth Summer—Three months' course in Midwifery, in Gynecology, in Medical Jurisprudence and Public Health, and in Clinical Surgery; Hospital Practice.

Fourth Winter— Six months' course in Medicine and Clinical Medicine; Hospital Practice.

Fifth Summer— Three months at Clinical Medicine; Hospital; Insanity; Diseases of Children; Diseases of Eye.
Practical Midwifery—Three months' attendance at a Lying-in Hospital, and conduction of Twelve Cases of Labour under official supervision.

Fifth Winter— Hospital Practice; Fevers; Dispensary; Vaccination; Skin Diseases; Ear and Throat Diseases; Eye Diseases; Venereal Diseases; Operative Surgery.

Professional Examinations.—Four of these are held during the curriculum. Each is held quarterly: for the ensuing period twice in Edinburgh and twice in Glasgow. Candidates may enter for all or any of the subjects at the First, Second, and Third Examinations. In the Final Examination the subjects of Medicine, Surgery and Midwifery shall be taken together at the conclusion of five Winters and five Summers of Medical Study, provided that a period of twenty-four months has elapsed since passing the Second Professional Examination; and the subject of Medical Jurisprudence and Public Health may be taken at any time after passing the Third Examination. Candidates are advised to enter for the entire examinations.

First Examination— Physics, Chemistry, and Elementary Biology. This should be passed before the beginning of the second winter session.

Second Examination— Anatomy, Physiology, and Practical Physiology. This should be passed at the end of the second year of study.

Third Examination— Pathology, Materia Medica, and Pharmacy. This should be taken at the end of the third year.

Final Examination— Can only be taken at the end of the fifth year. The candidate must have attained the age of twenty-one. It includes—

1. Medicine, Therapeutics, Medical Anatomy, Clinical Medicine.
2. Surgery, Surgical Anatomy, Clinical Surgery, Diseases and Injuries of the Eye.
3. Midwifery and Diseases of Women.
4. Medical Jurisprudence and Public Health. This can be taken any time after the Third Examination.

Fees for Professional Examinations.

For each of the first three, £5; for the final, £15. The minimum total expense, inclusive of fees for classes and examinations, amounts to £115.

Fees for examinations *in Edinburgh* should be lodged with Mr. D. L. Eadie, 49 Lauriston Place, and *in Glasgow* with Mr. Walter Hurst, 242 St. Vincent Street.

Diploma in Public Health of the Royal Colleges.

The Diploma is granted by the Triple Qualification Board.

1. Every candidate for examination must hold a registrable medical qualification, which has been registered under the Medical Acts.

2. After obtaining such qualification he must have attended a recognised Laboratory in which Chemistry, Bacteriology, and the Pathology of the Diseases of Animals Transmissible to Man are taught; and the certificate must show that the candidate has conducted Chemical and Bacteriological analyses of air, water, sewage and foods, and certify that the candidate has attended not less than four calendar months, and that he has worked in the Laboratory for at least 240 hours, of which not more than one-half shall be

devoted to Practical Chemistry. The following are alternative arrangements for British Armies in the field :—

The Laboratory experience at a Base Hygiene Laboratory, when and so far as approved by the General Medical Council, shall count towards the four months' Laboratory course prescribed by the Council ; and Laboratory experience acquired by medical officers on the staff of hospitals for infectious diseases shall count for such part of the Laboratory course for the Diploma in Public Health as the Assistant Director for Medical Services (Sanitation) may recommend, and the General Medical Council on consideration may approve.

3. After obtaining a registrable qualification he must during six months (of which at least three months shall be distinct and separate from period of Laboratory instruction required) have been engaged in acquiring a practical knowledge of the duties of Public Health Administration for not less than sixty working days under the personal supervision of—

(*a*) In England or Wales, the Medical Officer of Health of a County or single sanitary District having a population of not less than 50,000, or a Medical Officer of Health devoting his whole time to Public Health work ; or

(*b*) In Scotland or Ireland, the Medical Officer of Health of a County or District or Districts with a population of not less than 30,000 ; or

(*c*) In Ireland, a Medical Superintendent Officer of Health of a District or Districts having a population of not less than 30,000 ; or

(*d*) In the British Dominions outside the United Kingdom, a Medical Officer of Health of a Sanitary District having a population of not less than 30,000, who himself holds a Registrable Diploma in Public Health ; or

(*e*) A Medical Officer of Health who is also a Teacher in the Department of Public Health in a recognised Medical School.

(*f*) A Sanitary Staff Officer of the Royal Army Medical Corps having charge of an Army Corps, District, Command, or Division recognised for the purpose by the General Medical Council. During the continuance of the war, Base Districts on Lines of Communication of a British Expeditionary Force will be recognised.

4. After obtaining a medical qualification he must have attended for three months at least twice weekly the practice of a Hospital for Infectious Diseases, at which he has received instruction in the methods of administration.

The examination consists of two parts. The first part includes—(*a*) Laboratory work, with Chemistry and Bacteriology ; (*b*) Physics and Meteorology.

The Second Examination embraces—(*a*) Report on premises visited ; (*b*) Examination at Fever Hospital ; (*c*) Examination at Public Abattoir ; (*d*) Epidemiology and Endemiology ; (*e*) Vital Statistics and Sanitary Law ; (*f*) Practical Sanitation.

Each examination is held bi-annually, in October and May. The fee for each is £6, 6s. ; for re-examination, £3, 3s. Fees and applications to be lodged with Mr. D. L. Eadie, 49 Lauriston Place, Edinburgh ; or with Mr. Walter Hurst, 242 St. Vincent Street, Glasgow.

Membership and Fellowship of the Royal College of Physicians, Edinburgh.

Every applicant for the *Membership* must possess a recognised qualification, and be not less than twenty-four years of age. He must pass an examination on Medicine and Therapeutics, on Clinical Medicine, and on some Special Department of Medicine, such as Psychological Medicine, General Pathology and Morbid Anatomy, Medical Jurisprudence, Public Health, Midwifery, Diseases of Women, Diseases of Children, Tropical Medicine, etc. The Membership is conferred by election.

The fee for the Membership is thirty-five guineas, except the applicant be a Licentiate of the College, when it is twenty guineas.

Members of not less than three years' standing may be raised by election to the *Fellowship*, the fee being thirty-eight guineas, exclusive of Stamp Duty of £25.

Fellowship of the Royal College of Surgeons, Edinburgh.

Every candidate must be twenty-five years of age, and must have been engaged for two years in the practice of his profession, after having obtained a recognised qualification in Surgery. The petition for examination must be signed by two Fellows—a proposer and seconder.

The candidate must pass an examination on Principles and Practice of Surgery, including Surgical Anatomy, Clinical Surgery, and any one of the optional subjects; Surgical Pathology and Operative Surgery, Ophthalmology, Laryngology, Otology and Rhinology, Gynecology, Obstetric Surgery, Anatomy, and Dental Surgery and Pathology.

The fee is £45, except the candidate be a Licentiate of the College, when the fee is £35. Further particulars may be obtained from the Clerk to the College, 49 Lauriston Place, Edinburgh.

Fellowship of the Royal Faculty of Physicians and Surgeons of Glasgow.

Every candidate must have been qualified for two years, and be aged twenty-four. Admission to the Fellowship is by examination and subsequent election. The candidate is examined on either (*a*) Medicine (including Clinical Medicine, Medical Pathology, and Therapeutics), or (*b*) Surgery (including Clinical Surgery, Operative Surgery, Surgical Anatomy, and Surgical Pathology); and on one optional subject—Anatomy, Physiology, Pathology, Midwifery, Diseases of Women, Medical Jurisprudence, Ophthalmic Surgery, Aural, Laryngeal and Nasal Surgery, Dental Surgery, State Medicine, Psychological Medicine or Dermatology.

The fee is £30, except the candidate be a Licentiate of the Faculty, when it is £15.

The Fellowship Diploma is now open to Women.

EDINBURGH POST-GRADUATE COURSES IN MEDICINE.

In connection with the University and Royal Colleges.

In order to provide for the special needs of the present time, the Executive Committee have arranged courses which are specially designed to meet the requirements of Graduates returned from active service on demobilisation.

All courses are open to Women Graduates.

Three courses have been arranged :—

A. A Course in Clinical Medicine.
B. A Course in Clinical Surgery.
C. A Course in Obstetrics, Gynecology, and Child Welfare.

Courses *A* and *B* are conducted during each of the Academic Terms. They have already been held during the past Summer Term (April to June), and were well attended. These courses will be repeated during the Autumn Term (October to December), commencing 14th October 1919, and the Winter Term (January to March), commencing 6th January 1920.

Course *C* is conducted during the Summer Vacation (August and September) only.

As the work of each course occupies the greater part of each day, only one course can be taken at a time.

The instruction is given conjointly by the Professors in the Faculty of Medicine, the University Lecturers and Assistants, the Lecturers in the Extramural School, and the members of the Honorary Staffs of the Hospitals.

Course A.—Clinical Medicine.

This course includes a series of daily Lecture-Demonstrations on General Medicine, Medical Diseases of Children, Tuberculosis, Medical Ophthalmology, Neurology, Dermatology, Infectious Diseases, Mental Diseases, etc. Arrangements are made by which members of the course may follow the general medical practice of the Royal Infirmary and Royal Hospital for Sick Children in the wards and out-patient departments. Those members of the course who desire to concentrate their attention on a special subject may, by arrangement, be attached as extra-clinical assistants in the medical wards of the Royal Infirmary, the Royal Hospital for Sick Children, the Royal Victoria Dispensary for Tuberculosis, the Eye Department, or the Skin Department of the Royal Infirmary.

Provision is also made for practical instruction in Applied Anatomy, Physiology, Pathology, Bacteriology, and a limited number of members of the course may, by arrangement, act as assistant-demonstrators in the practical classes on these subjects under the Professors and Lecturers.

Members who desire to act as demonstrators in practical classes and clinical assistants in special departments are allocated to these in order of application up to the number of vacancies.

Course B.—Clinical Surgery.

This course includes daily Lecture-Demonstrations on General Surgery, Surgical Diseases of Children, Aural, Nasal, and Laryngeal Surgery, and Venereal Diseases. Arrangements are made by which members of the course may follow the surgical practice of the Royal Infirmary and the Royal Hospital for Sick Children in the wards and operating theatres and in the out-patient departments. Facilities are afforded to members of the course who desire to concentrate their attention on a special branch of Surgery to act as extra-clinical assistants in the department selected.

Provision is also made for practical instruction on Surgical Anatomy, Pathology, and Bacteriology, and a limited number of members may, by arrangement, act as assistant-demonstrators in the practical classes under the Professors and Lecturers.

Members who desire to act as demonstrators in practical classes and clinical assistants in special departments are allocated to these in order of application up to the number of vacancies.

Course C.—Obstetrics, Gynecology, and Child Welfare.

This course includes Cliniques at the Royal Infirmary on Diagnosis and Treatment in Gynecology, and at the Royal Maternity Hospital on the Diseases of Pregnancy (in the Prematernity Ward), on Labours, the Puerperium, and the New-born Infant; Lecture-Demonstrations on the Morbid Anatomy of Gynecology, of Obstetrics (including the Pathology of Pregnancy and the New-born), and of Antenatal Diseases (including Teratology); Demonstrations of Operative Measures and of Instrumental Appliances in Gynecology and Obstetrics; and Clinical Instruction in Mother and Child Welfare at the various Health Centres (including clerking at the Antenatal Clinic and Infant Centres, study of the details of the working of the Town System in the Social and Medical Aspects).

Fees.—The fee for each of the Courses, *A* and *B*, is Twenty-five Guineas (including Hospital Tickets*); for Course *C*, Twenty Guineas.

Those who desire to enter for these courses should do so as early as possible. All particulars may be had on application to the Secretary, Post-Graduate Courses in Medicine, University New Buildings, Edinburgh.

* Graduates who hold a perpetual Hospital Ticket receive a corresponding rebate.

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Edinburgh medical journal

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